



First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 544 (No. 22, Vol. XI.)

MAY 29, 1919

Weekly, Price 6d.
Post Free, 7d.

Flight

and The Aircraft Engineer

Editorial Office: 36, GREAT QUEEN STREET, KINGSWAY, W.C. 2

Telegrams: Truditur, Westcent, London. Telephone: Gerard 1828.

Annual Subscription Rates, Post Free:

United Kingdom .. 28s. 2d. Abroad.. .. 33s. 6d.

These rates are subject to any alteration found necessary under war condition

CONTENTS

	PAGE
Editorial Comment:	
Safe!	689
Wonderful Navigation	689
The Daily Mail and the Flight	690
The Immediate Prospects	690
"Three Weeks in the Air"	690
Flight—and the Men: Mr. Claude Grahame-White	691
The Transatlantic Flight	694
The Curtiss Model 18-T Triplane	698
The Royal Aero Club: Official Notices	700
The Tarrant Triplane	702
The Stresses in Braced Structures with Rigid Joints. By John Case	704
Airisms from the Four Winds	707
Metal Construction of Aircraft. By A. P. Thurston	710
Personals	715
Aviation in Parliament	716
The Royal Air Force	717
Correspondence	719
Side-Winds	721
Company Matters	722

EDITORIAL COMMENT

IT is no exaggeration to say that a thrill of relief passed over all the world when it was announced on Sunday afternoon that, after being given up as lost, Hawker and MacKenzie-Grieve had been picked up in mid-Atlantic by a Danish steamer, and were safe and sound on board

a British warship. Until they return to London, where they will not arrive until after most of this

issue of FLIGHT has gone to press, we shall not know the full story of their thrilling experience in the gallant attempt they made, for the honour of their country, to be first across the Atlantic in the air. So much is known, however, that we are able to appreciate the wonder of their feat and to sympathise in its failure. They came very near to success, for, after covering more than half their journey, they were compelled to descend through a mishap which

would not happen once in a hundred times. Nothing had happened to the machine itself. The dropping of the under-carriage, which some theorists believed had so upset the balance of the machine that it had come down into the sea very early in the flight, does not appear to have affected it one way or the other. The engine had continued to run perfectly and had given no trouble at all until almost the moment they were compelled to come down. From reports so far, it seems that the water pump became choked by dirt and solder shaken down from the radiator by the vibration, with the consequence that the water circulation failed and the motor ran hot. Even after the water in the jackets had boiled away, the engine seems to have functioned perfectly for some considerable time. At least it appears, from the very fragmentary news that has so far reached us, that it ran for long enough to enable the intrepid pair to make a fairly good descent close to the *Mary*, the vessel which picked them up.

The details of the flight and of the precise cause of the trouble which turned a potential success into a glorious failure must await the return of the gallant companions for relation. It is sufficient for the moment that they have returned from the dead, as it were. The whole world rejoices that they are safe, and that is enough for the present.

Wonderful Navigation

Even in the light of the scanty details at present available, it is clear that the 1,100 miles flight across the trackless Atlantic from Newfoundland to the point where the Sopwith was forced to descend constitutes a wonderful feat of navigational accuracy. We know that the weather conditions were all against successful navigation. In particular, the strong southeasterly winds that set in during the early hours of the day after the start, must have caused the machine to set heavily to the northward, yet the position in which Hawker and his navigator were picked up was not more than twenty miles north of the direct course from St. John's to Valencia. When it is recollected that aviators have been hopelessly lost in the narrow waters of the Channel and the North Sea, and that it is but yesterday that the real art of navigation was adapted to aerial traffic, it seems nothing short of wonderful that the Sopwith should have been so closely navigated. She got no farther

out of her course than did the American seaplanes on their flight from Newfoundland to the Azores, while it must be pointed out that the two performances are not comparable in the matter of difficulties of navigation. In the one case, the Americans had nothing to do but navigate by sight. There was a destroyer or some other vessel posted along every few miles of route, so that, as soon as one was lost, the next could be picked up. Thus the navigational problem was reduced to the last terms of ease. In the case of Hawker and his companion, however, there were none of these adventitious aids, and they had to depend for their reckoning on astronomical observations and the sighting of chance vessels along the line of route. It seems to us that the flight has taught at least one lesson—that the art of aerial navigation has been brought to a state of reasonable perfection, and that in this department there will be little to fear on the score of safety of travel. Twenty miles out in a thousand would not be bad navigation in the case of a slow-steaming ship, where celestial observations had not been obtainable and dead reckoning had to be depended upon.

The Daily Mail and the Flight

Lord Northcliffe and the *Daily Mail* have certainly acted in a worthy and sportsmanlike manner in the matter of the flight. When hope of the safety of Hawker and his navigator had been practically abandoned at the end of last week, the *Mail* announced that it had been decided to pay the amount of the prize-money—£10,000—to be divided between Mrs. Hawker and the relatives of Commander Mackenzie-Grieve, in the event of the two gallant aviators having lost their lives. The offer of the £10,000 prize for the first successful Atlantic flight, under the published conditions, was still to stand. Fortunately, the *Mail* will not be called upon to make good its magnificent promise, but the moment the good news of Hawker's safety was made known it announced that in recognition of the plucky attempt to win the prize itself, and more by way of appreciation of the endeavour to uphold the honour of Britain, it had resolved to present a consolation prize of £5,000, to be divided in the same manner as the prize itself would have been had the attempt succeeded. No single individual has done more to encourage progress in aviation than Lord Northcliffe, added to which the fact that he is the head of a very powerful group of newspapers has enabled him to see that the very fullest publicity should be given to all records of progress and performance. Aviation is under a heavy debt of gratitude to Lord Northcliffe and his journals, and the magnificent action of the *Daily Mail* in the matter of the Atlantic flight adds yet another score to that volume of indebtedness.

The Immediate Prospects

As to the immediate prospects of a successful crossing of the Atlantic by aeroplane, now that the Hawker combination is out of the running for some considerable time, it cannot be said that these are too rosy. The Americans are, at the time of writing, still detained at the Azores by weather conditions, and there seems to be no present indication of sufficient improvement to enable a start to be made on the second stage of the Transatlantic flight.

In Newfoundland the conditions also are unpromising, even if there was anyone there ready to make a start. Mr. Raynham's machine seems to be hopelessly out of the running in the meantime, and it must be weeks before it can be ready to fly again. The Handley-Page is not ready yet, and would hardly essay the crossing in any case until the weather conditions have become more stable, while the same is to be said of the other competitors for the honour of being first to cross the Atlantic.

After carefully balancing up all the probabilities, it really begins to look as though the honour of actually crossing might fall to the lighter-than-air machine after all, if the Air Ministry and the Admiralty between them can make up their minds to essay the flight with one of the new great rigid airships, although, if successful, this would not affect the *Mail* £10,000 prize. For some weeks past reports have been rife that R.33 or R.34 was to make the attempt, but so far no official announcement has been made. To our way of thinking, it should be done, and done at once. There is not the slightest doubt that, had it not been for the accident to the American airship C.5, she would have made the attempt long ere this, and would in all probability have succeeded. Surely, if it is desirable that this country should maintain the commanding lead in aviation it obtained during the war, it is worth an effort to be first to bridge the Atlantic by air. Hawker and Mackenzie-Grieve having gloriously failed in their attempt to achieve the honour and to credit it to the old country, there are others waiting impatiently to take the self-same risk, and we doubt not they will accept it with the same cheerfulness as those who set out on the first attempt ten days ago. We have not one but several airships which are capable of making the flight with ease, and we are deliberately of opinion that it would be well worth while that one of them should do so. And, if there is any imagination at all in the Departments concerned, they will see that it is done, and without a moment's unnecessary delay.

"Three Weeks in the Air"

According to the *Daily Mail* New York correspondent, a statement has been issued by the U.S. Army Air Service in which it is prophesied that before many years are past there will exist giant, all-metal airships, capable of cruising for 60,000 miles and of remaining in the air for three weeks. "We reasonably may expect," this official statement says, "in the near future to have Transcontinental airships in the United States capable of carrying nearly 200 tons of useful load. Obviously it will be such airships that will transport first-class mail and some passengers. Aeroplanes will not be displaced by these mammoth ships. The natural employment of aeroplanes in great number will be for the local distribution of mail in all directions from the main airship stops across the continent." It predicts also that the British will inaugurate a regular airship service to Paris, Rome and Canada this year, and adds: "The vast expanse of the United States seems exceptionally favourable for the establishment of similar air routes, including a service to Alaska, Hawaii, Porto Rica, Cuba and Panama."

We believe the memorandum is not far off the truth. In fact, so far as concerns the advent of the



Mr. CLAUDE GRAHAME-WHITE, Managing Director of the Grahame-White Co., Ltd.

"Flight" Copyright.



big airship with a capacity of 200 tons of useful load, it is an open secret that our own designers are prepared with the plans of a ship of 10,000,000 cub. ft. capacity, designed to lift a useful load of about 170 tons, and that they see no practical difficulties in the way of its construction. After all, when the 3,000,000 cub. ft. capacity has been reached and passed, it is not a supremely difficult matter to increase up to the size we have mentioned. There is certainly a good deal to be said for the theory that the future of long-distance overseas air traffic is more likely to be with the airship than with the aeroplane. It is true we have not yet had a real demonstration of what the big airship can do in the matter of really long flights and endurance, though we certainly have the knowledge that a Zeppelin cruised down from the Balkans to German East Africa during the War, and, what is more, returned to her base in safety. This represented a flight of approximately 5,000 miles, which is far and away a better endurance performance than is possible to anything in the shape of a heavier-than-air machine. Again, it is believed that one of the latest ships of the Zeppelin type actually kept the air for over 100 hours and maintained a height of nearly 20,000 ft. during practically the whole of that time. Obviously vessels which are capable of such feats of endurance must have a good deal to say in regard to the future of long-distance aerial traffic. Indeed, to shorten the argument, it may be said definitely that there is not the slightest doubt now that the large airship is a thoroughly practical vessel, capable of keeping the air for long periods and possessing an enormous range of action. There is no reason to quarrel with the American belief that such ships can be built with a cruising radius of 60,000 miles and an endurance of anything up to three weeks.

If we accept these premises—and, as we have said, there is no reason why we should not—it becomes quite clear that here we have the real vehicle of overseas and transcontinental air services. Whether we accept the further theory that the real use of the

aeroplane will prove to be as defined in the U.S. memorandum is another matter. Our own impression is that it regards the aeroplane as having more limitations than it, in fact, has. We see no reason why the aeroplane should not ultimately be capable of traversing the overseas routes with the same certainty and regularity as the airship. Admitted that it cannot do so at present, we must remember that in spite of all the progress that has been made, aviation is still an infant science, and as such is capable of still further enormous expansion and development, not only as to service but as to the actual design and construction of machines, and particularly of the power plant. We must not forget in this last connection that our forefathers had solved the theory of dynamic flight many years—almost centuries—before aviation became a practical art, and that the only thing which prevented them from taking successfully to the air was the want of a prime mover light enough and efficient enough to convert their theories into practical possibilities. It was not until the perfecting of the internal combustion motor gave us this prime mover that flight became practical and the first real progress began to be made. Has the last word been said about the power plant? We cannot say, but surely no one will be found bold enough to say that we have reached finality either in that or in the design of the machine *qua* machine. All sorts of developments are possible. For example, may it not be possible in the future to drive machines by light electric motors picking up current projected into the ether by wireless? It may be a far-fetched idea, but will anyone say definitely and of exact knowledge that it is a scientific impossibility? We doubt it. There is only one definite conclusion which can be reached at the moment and that is that aviation is still capable of enormous development along lines which we cannot foresee at the present time, and that nothing is inherently impossible when we are thinking in terms of that great development of the future. And this applies equally to the airship as to the aeroplane.

Royal Air Force Sports

THE Royal Air Force annual athletic meeting for the challenge cup presented by His Majesty the King will take place on Thursday, August 21, at Stamford Bridge ground, Chelsea. The events included in the competition are: Flat races, for distances of 100, 220, 440 and 800 yards; one mile and 3 miles; hurdle, high jump, long jump, relay race, tug-of-war and a W.R.A.F. relay race. The competition is an inter-area one, and after preliminary selection one team will be selected to represent each area for each team event, or three individuals in the case of individual events. Further details are to be issued later.

A Seaplane Endurance Test

IN view of the recent Transatlantic achievement of the American seaplanes the following details with regard to an endurance test just carried out by a British service seaplane are instructive.

The type of seaplane used—an F. 5—was an ordinary production machine, and was fitted with two 350 Eagle VIII Rolls-Royce engines. The ascent was made from Felixstowe at 8.20 p.m. with Capt. Scott, D.S.C., as pilot, Capt. Dickey, D.S.C., as navigator, and two mechanics. Weather conditions were good once the machine was in the air, but a choppy sea was running at the time, and before taking off a certain amount of water was shipped. Moreover, the direction of the wind and the condition of the sea rendered it necessary to taxi outside the harbour for some distance before actually taking off, which reduced the amount of petrol actually available for the flight. The course followed was a coastal one, passing Margate, Eastbourne, Bognor, Brighton, Folkestone, Ramsgate, Sheerness, Cromer, Southwold, Lowestoft and back to

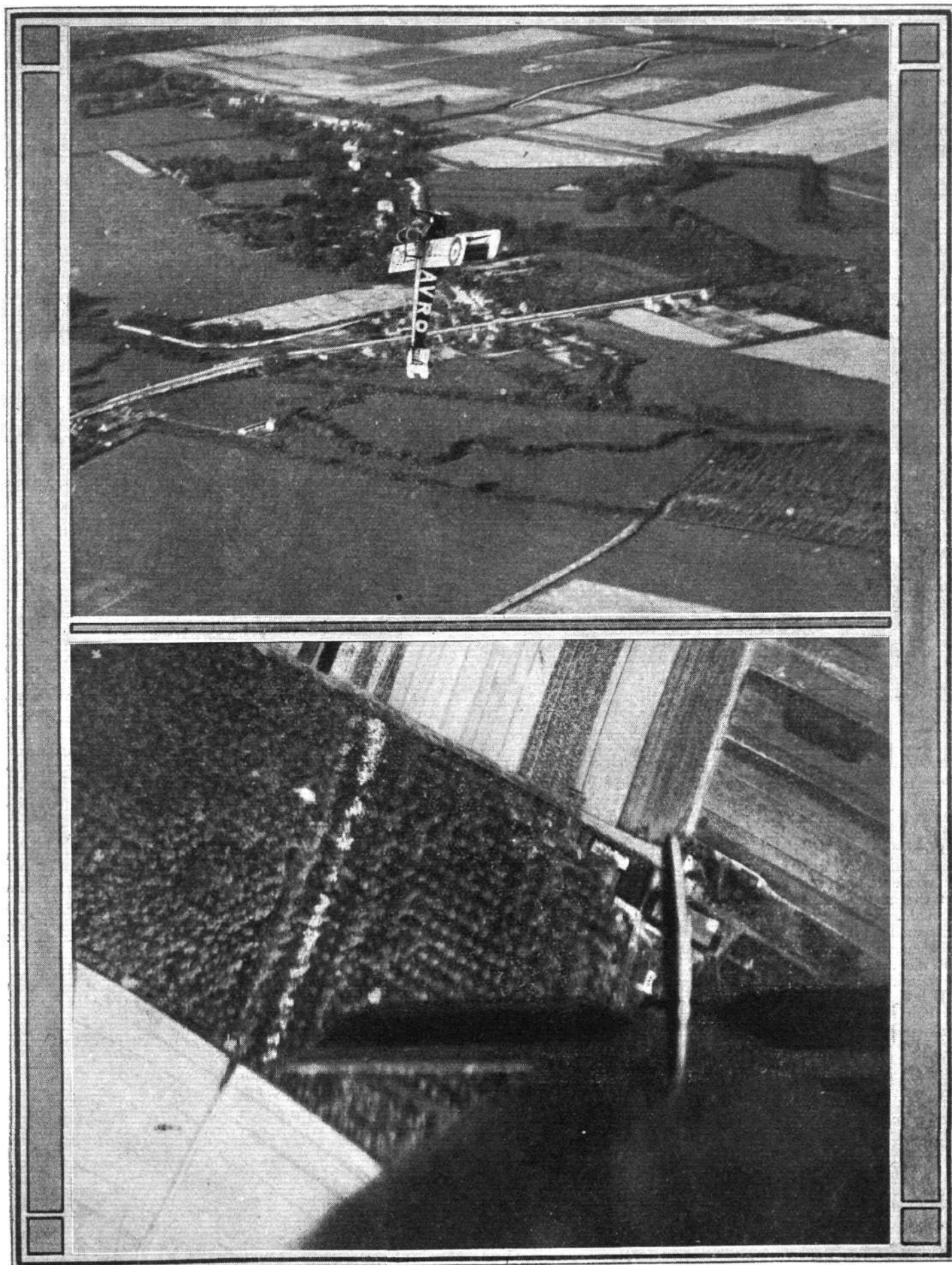
Felixstowe. No attempt to land was made until the engines actually stopped from lack of petrol. This, of course, was done deliberately as a test and the machine was flying continuously for no less than 14 hrs. 8 mins., or, including getting out of harbour, 14½ hrs., landing at Felixstowe again at 10.20 a.m. the following morning.

No engine trouble of any sort was experienced, and had more petrol been carried the flight could have been considerably prolonged. No special modifications were made, and the ordinary service load was carried. The total weight of the machine with crew at the time of ascent was 13,710 lbs., of which 150 lbs. was water shipped in the choppy sea before taking off. The average speed maintained was about 55 knots, and wireless communication was maintained with the base at Felixstowe throughout the flight.

Airmen's Artificial Limbs

AN order has just been issued by the Air Ministry with regard to the supply and renewal of artificial limbs for disabled airmen. The procedure followed is precisely the same as that applying to disabled soldiers, *i.e.*, through the Local War Pensions Committee, and the Director of Artificial Limb Supplies—Ministry of Pensions. Thus, if a discharged disabled airman is in need of further surgical treatment, or if his artificial limb requires repair, he should apply direct to his local War Pensions Committee. In the former case the Committee will arrange for his treatment by the nearest civil, military or Air Force hospital available.

The Committee will also defray all travelling expenses necessarily incurred by a discharged airman in connection with the repair or renewal of his artificial limb and his attendance at the hospital selected.



"Flight" Copyright

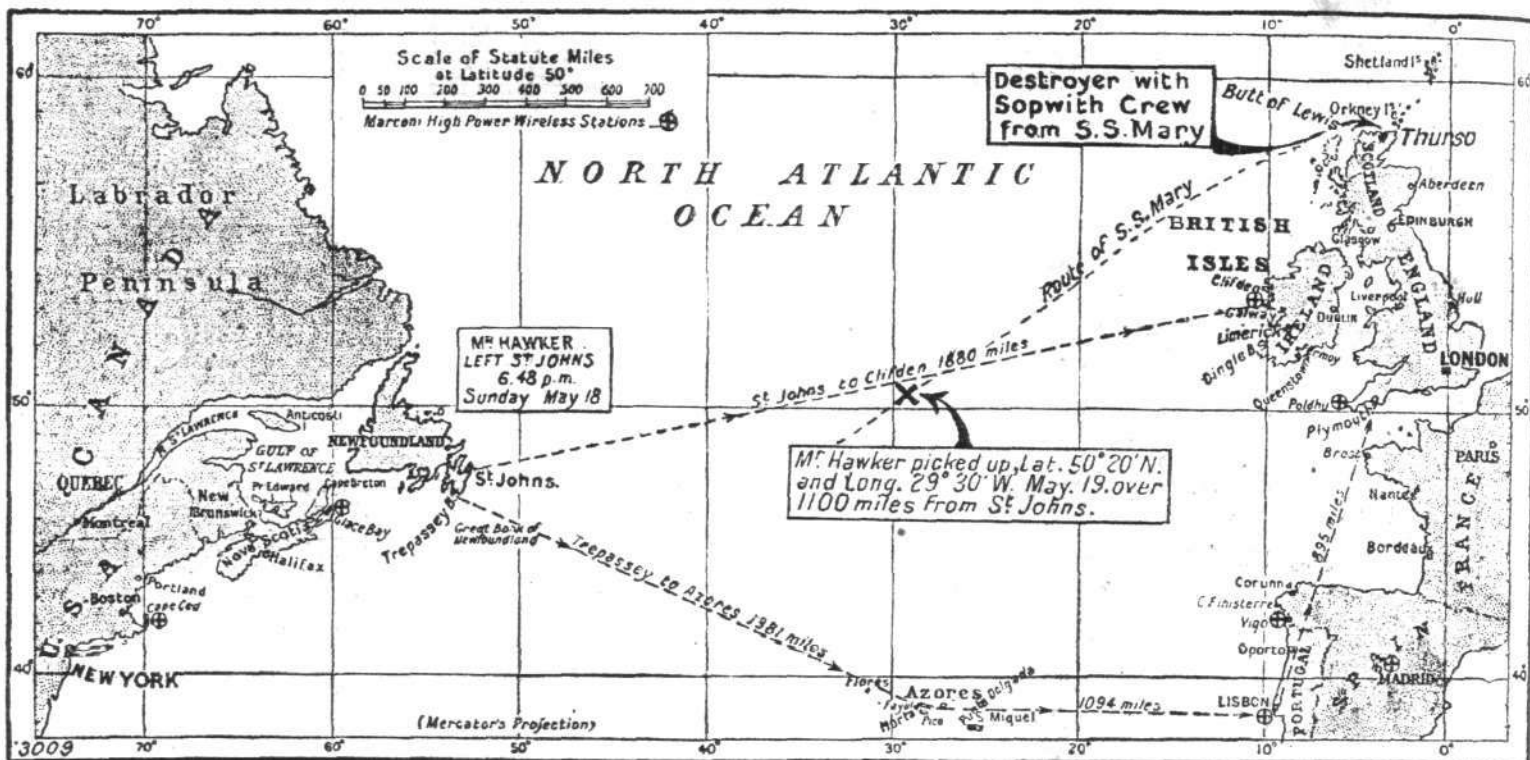
A REMARKABLE PAIR OF PHOTOGRAPHS : Last week we published some Flight photographs taken at Hounslow Aerodrome, and reference in the text was made as follows : " With the co-operation of Messrs. A. V. Roe, we were able to obtain some fine photographic records from the air of looping—taken from the ' looper ' by the ' loopee, ' and from a sister Avro accompanying the looper. Two of these photographs are of special interest in that one was taken during a loop, showing the ground appearing below the tail." These unique photographs, which, as must be obvious, were taken simultaneously, but independently, from the two machines, are now, by request, reproduced above.

THE TRANSATLANTIC FLIGHT

HAWKER AND GRIEVE RETRIEVED

It was a wonderful reception which London gave to Mr. Hawker and Commander Grieve on Tuesday evening. And London's effort was but the culmination of a series of welcomes growing more and more enthusiastic as the train made its way south from Scotland. Edinburgh, Newcastle, Darlington, York and Grantham had all turned out in force to honour the two brave men, but when the train arrived at King's Cross, it was to meet a sea of humanity so dense that it was only with difficulty that the carriage door could be opened. When Mr. Hawker and Commander Grieve

On arrival at the Royal Aero Club, Mr. Hawker and Commander Grieve had another rousing reception, and were congratulated by a large number of members. After Mr. Hawker had briefly returned thanks, he left with Mrs. Hawker for Ham, where they arrived at 9.30. In the grounds of the Sopwith works an open-air concert was in progress, and the reception of Mr. and Mrs. Hawker can only be described as wildly enthusiastic. After a little stay Mr. and Mrs. Hawker were towed by the Sopwith workers in their motor-car to Kingston, where they dined with Mr. and Mrs. Sopwith.



THE ATLANTIC FLIGHT.—Map prepared by the "Times" of where Mr. Hawker and Commander Grieve were picked up. The cross shows the spot where they were rescued by the Danish steamship "Mary," which then proceeded on her course to Denmark, past the Butt of Lewis, until she was intercepted by the British destroyer "Woolston."

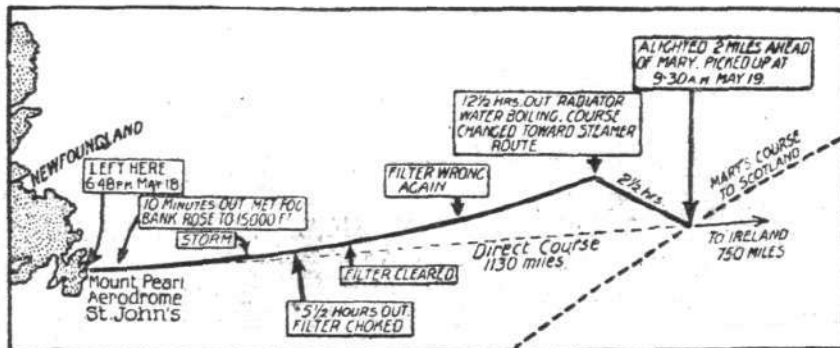
did emerge they were at once carried shoulder high by Australian soldiers to a motor car to which ropes had been attached. Some 200 soldiers attempted to pull the car, but the crowd was so thick that very little progress could be made. Eventually Mr. Hawker got up behind a mounted policeman and was able to continue on his way. Then the policeman gracefully surrendered his horse to Mr. Hawker, who was thus able to lead a slowly-moving procession of motor cars, etc., to the Royal Aero Club in Clifford Street.

It had been intended that the Mayor and Corporation of St. Pancras and the Royal Aero Club should combine in the

Mrs. Hawker and Mr. and Mrs. Sopwith went down from London and met the train at Grantham.

At Newcastle, Newark and Grantham, the train had an aerial escort. At Grantham Mr. Clifford Prodger was flying a B.A.T. bantam.

Mr. Hawker and Commander Grieve were received at Buckingham Palace by the King, the Queen and the Prince of Wales on Wednesday. His Majesty, breaking down all precedents and official routine, personally decorated the two airmen with the Air Force Cross for gallantry in the air.



THE ATLANTIC FLIGHT.—Map showing the directions of the Sopwith machine on its journey.— ("Daily Mail" map.)

reception at King's Cross, but this was rendered impossible by the crowd. Among those present at the station were Lord Montagu of Beaulieu, Gen. Sir W. S. Brancker, Gen. Sir Capel Holden, Col. Dunville, Mr. T. Marlowe, Mr. Handley Page, Mr. R. Carey (of the Sopwith Co.), Col. F. K. McLean, Commander Perrin, Mr. Sydney Pickles, Col. Spenser Gray, D.S.O., Col. Warwick Wright, D.S.O., Mr. Ralston, Mr. C. Fox, Mr. J. E. Withers, Mr. W. G. Rannels, United States Aviation Service, and Lieut. Louis Noel, late of the French Aviation Service.

On Wednesday also the *Daily Mail* entertained Mr. Hawker and Commander Grieve to luncheon at the Savoy Hotel. We regret that owing to an impending operation on his throat Lord Northcliffe was unable to preside at this memorable gathering, at which a large number of distinguished persons assembled to do honour to the two brave men. Mr. T. Marlowe presided, and the consolation prize of £5,000 was handed to Mr. Hawker and Commander Grieve by Maj.-Gen. J. E. B. Seely, the Under-Secretary of State for Air.

The Royal Aero Club will honour Mr. Hawker and



"Daily Mail" photographs.

THE GREAT ATLANTIC ADVENTURE.—Are we Missing? We should smile! Mr. G.H. Hawker (on left), pilot of the Sopwith machine, and Commander Mackenzie-Grieve, the navigator, who in mid-ocean were taken on board the Danish steamer "Mary," when their unfortunate water-circulation mishap compelled them to seek safety with this passing vessel

FLIGHT
MAY 29, 1919

Commander Grieve on Friday next at a luncheon at the Savoy Hotel.

It was with great relief that London heard the news on Sunday afternoon that Hawker and Commander Grieve had been saved. After a week of waiting it seemed as though the news could not be true.

The official news was made known by the following message from Lloyd's :—

" May 25.—No. 1.

" Lloyd's signal station at Butt of Lewis telegraphs this morning as follows :—

" Danish steamer *Mary* passing eastwards signalled following :—' Saved hands Sopwith aeroplane.' Station signalled :—' Is it Hawker ?' Steamer replied :—' Yes.' Note.—The Danish steamer *Mary* left New Orleans April 28 for Horsens (Denmark)."

Steps were immediately taken by the Admiralty to intercept the *Mary* and the airmen were embarked on the destroyer *Woolston*, the Air Ministry announcing :—

" The Admiralty reports that the destroyer *Woolston* has intercepted the Danish steamer *Mary* and has embarked Hawker and Grieve. They will be landed at Thurso."

At a later hour the following further statement was issued by the Air Ministry :—

" The Admiralty reports that Mr. Hawker and Commander Grieve have arrived on board H.M.S. *Revenge*, where they will sleep. They will leave by destroyer tomorrow and catch a train which is due to arrive at King's

Cross at 7 p.m. on Tuesday. They were picked up at Lat. 50° 20' N. and Long. 29° 30' W., having alighted close to the steamer owing to a stoppage of circulation in the water pipe between the radiator and the water pump. The aeroplane was not salvaged. Both airmen are in perfect health."

The airmen were thus picked up quite near to where they had been sighted by the *Faraday*, and something over 1,100 miles from St. John's.

The *Daily Mail* received the following message from Mr. Hawker :—

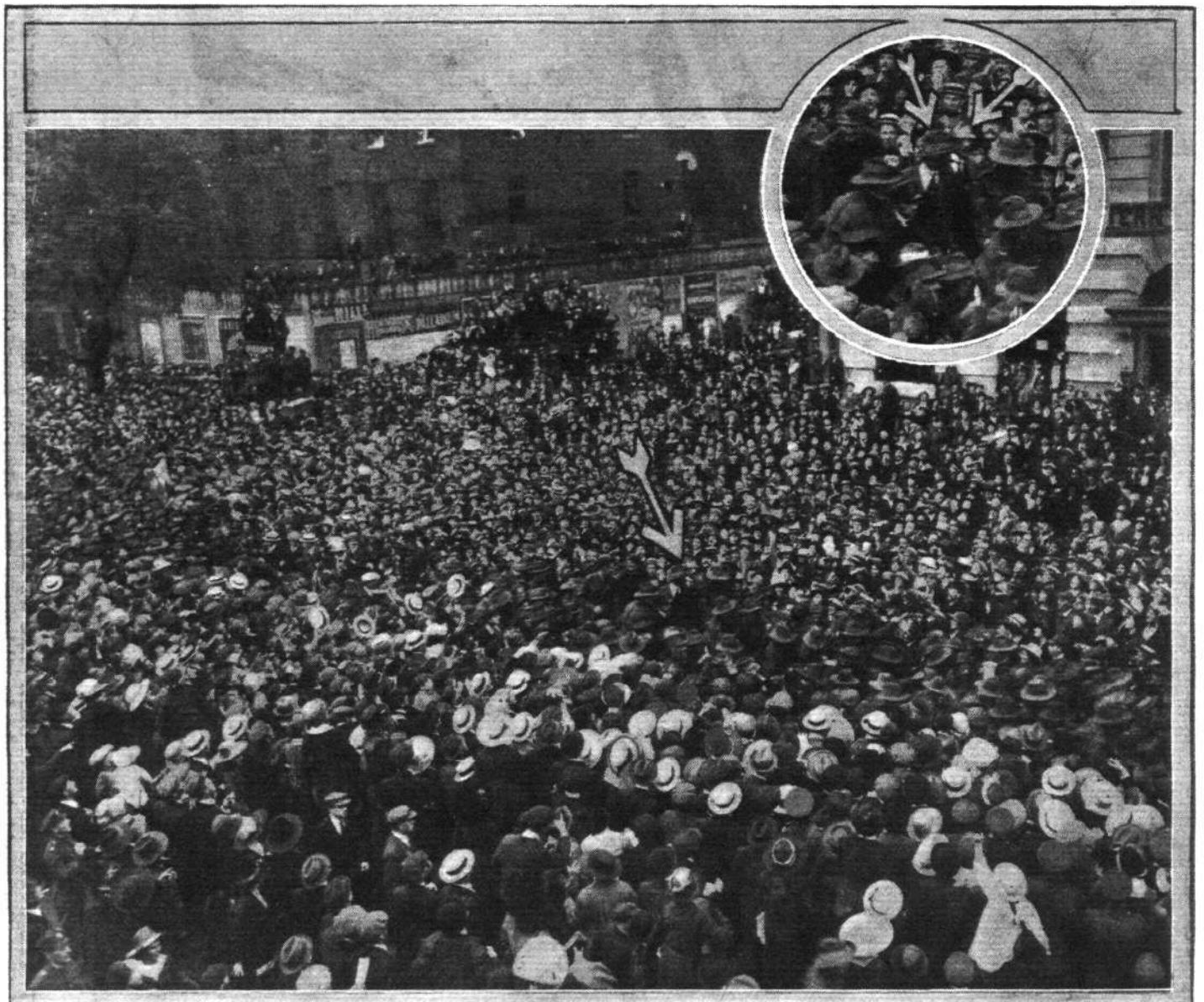
" H.M.S. *Revenge*, Scapa, May 25, via Aberdeen, 10.35 p.m.

" My machine stopped owing to the water filter in the feed-pipe from the radiator to the water-cock being blocked up with refuse, such as solder and the like, shaking loose in the radiator.

" It was no fault of the motor (Rolls-Royce). The motor ran absolutely perfectly from start to finish, even when all the water had boiled away. I had no trouble in landing in the sea. We were picked up by the tramp ship *Mary*, after being in the water 1½ hours."

For a terse description of what happened, we cannot do better than quote Mr. Hawker's story as given to the *Daily Mail* on his arrival at Thurso on Monday. Mr. Hawker said :—

" We had a very difficult ground to rise from on the other side. To get in the air at all we had to run diagonally across the course. Once we got away we climbed very well, but



"Flight" Copyright.

The arrival in London of Mr. Hawker and Commander Mackenzie-Grieve on Tuesday evening.—Scene outside King's Cross Station. Note: The two aviators (indicated by an arrow, Mr. Hawker "crowned" with an Australian military hat, and Commander Mackenzie-Grieve hatless) are supposed to be proceeding through the crowd in a motor car. Puzzle, find the car! The inset is an enlargement of the section of the crowd with the two aviators

about ten minutes up we passed from firm, clear weather into the fog off the Newfoundland banks. We got well over this, however, and, of course, at once lost sight of the sea.

"The sky was quite clear for the first four hours, when the visibility became very bad. Heavy cloud-banks were encountered, and eventually we flew into a heavy storm, with rain squalls. At this time we were flying well above the clouds at a height of about 15,000 ft.

"About 5½ hours out, owing to the choking of the filter, the temperature of the water cooling our engines started to rise, but after coming down several thousand feet we overcame this difficulty. Everything went well for another few hours, when once again the circulation system became choked, and the temperature of the water rose to boiling point. We, of course, realised that until the pipe was cleared we could not rise much higher without using a lot of motor power.

"When we were about 12½ hours on our way the circulation system was still giving trouble, and we realised we could not not go on using up our motor power. Then it was that we reached the fateful decision to play for safety. We changed course, and began to fly diagonally across the main shipping route for about 2½ hours, when, to our great relief, we sighted the Danish steamer, which proved to be the tramp *Mary*.

"We at once sent up our Verey light distress signals. These were answered promptly, and then we flew on about two miles and landed in the water ahead of the steamer.

"The sea was exceedingly rough, and, despite the utmost efforts of the Danish crew, it was an hour and a half before they succeeded in taking us on. It was only at great risk to themselves, in fact, that they eventually succeeded in launching a small boat, owing to the heavy gale from the north-east which was raging. It was found impossible to save the machine, which, however, is most probably still afloat somewhere in mid-Atlantic.

"Altogether, before being picked up, we had been 14½ hours out from Newfoundland. We were picked up at 8.30 a.m. on Monday (Greenwich time; 9.30 British Summer time). From Capt. Duhn, of the *Mary*, and his Danish crew we received the greatest kindness on our journey home. The ship carried no wireless, and it was not until we arrived on the Butt of Lewis that we were able to communicate with the authorities.

"Off Loch Erribol we were met by the destroyer *Woolston* and conveyed to Scapa Flow, where we had a splendid welcome home from Admiral Fremantle and the men of the Grand Fleet."

Commander Mackenzie Grieve, the navigator, said:—

"When a few hundred miles out a strong northerly gale drove us steadily out of our course. It was not always possible, owing to pressure of the dense masses of cloud, to take our bearings, and I calculate that at the time we determined to cut across the shipping route we were about 200 miles out of our course. Up to this change of direction we had covered about 1,000 miles of the journey to the Irish coast."

As Commander Grieve says that no red Very lights were fired from the aeroplane, it can only be concluded that the red light reported as having been seen by the cable steamer was the exhaust from the engine.

The *Daily Mail* will suitably recognise the efforts of the captain and crew of the *Mary* who, as Mr. Hawker says, risked their own lives to save the airmen.

Immediately on the news being received, a stream of congratulatory messages began to be received by Mrs. Hawker.

The King rejoices with you and the nation on the happy rescue of your gallant husband. His Majesty trusts that he may long be spared to you.—STAMFORDHAM.

Queen Alexandra telegraphed:—

"With all my heart I wish you and the nation joy on the safety of your gallant husband and his companion. I rejoice that a Danish ship rescued his precious life.—ALEXANDRA."

Other messages in the incessantly growing pile were:—

"I rejoice to see your husband is safe and beg to send you our cordial congratulations.—Gen. SEELY, Air Ministry."

"The Air Council sends you hearty congratulations on the safety of your gallant husband.—AIR MINISTRY."

Other messages were from Sir Robert Borden, the Canadian Premier, Lieut.-Col. Barker, V.C., the Right Hon. Andrew Fisher, High Commissioner for Australia, the Hon. G. F. Pearce Australian Minister for Defence, and Sir Joseph Cook, Australian Minister for the Navy.

Information was received in London early on Wednesday morning that the s.s. *Sachem* of the Furness line, on arriving at St. John's, Newfoundland, reported having received a wireless message from the American steamer, *Lake Charleville* to the effect that she had picked up in mid-ocean last Friday the Sopwith aeroplane on which Hawker and Grieve started their flight.

The following announcement was made by the *Daily Mail* on May 23:—

"There is still no news of the heroic British airmen, Mr. Hawker and Commander Grieve, R.N.

"We consider that it is still too soon to abandon hope of their safety; but we have decided to announce, while the issue is still uncertain, that in the unfortunate event of Mr. Hawker and Commander Grieve having lost their lives, the *Daily Mail* will offer £10,000, the amount of the prize-money, to Mrs. Hawker for the benefit of herself and her baby daughter and to Commander Grieve's next-of-kin, in the proportions by which, as we understand, the airman and his navigator had already agreed to share it between them.

"We shall, of course, allocate a further sum of £10,000 to the *Daily Mail* Atlantic Flight prize, which is still open."

The following announcement was made by the *Daily Mail* on Monday:—

The *Daily Mail* £10,000 prize for the first flight across the Atlantic by a heavier than air machine, under the rules drawn up and administered by the Royal Aero Club, remains to be won, and it is probable that it will be won before the end of the summer.

The attempt made by Mr. Harry Hawker and his navigator, Commander Grieve, R.N., ended at 6.30 on Wednesday evening, when the time limit of 72 hours expired.

Desiring, however, to recognise the determined nature of their effort, which has filled their countrymen and women with admiration, the *Daily Mail* has decided to award them a consolation prize of £5,000, which will doubtless be divided between them in the proportions upon which it is understood they had agreed with regard to the £10,000 prize.

The following cablegram from Rome, Georgia, signed J. P. Jones, has reached the *Daily Mail*:—

"Friends of Commander John Tower, of the United States Navy in Rome, Georgia, wish to present airmen Hawker and Grieve with 200 dols. (£40) as a tribute to their bravery. Mailing cheques."

A great air rally is being arranged to take place at Hendon on Saturday afternoon. It is hoped that some pilots will fly over from Paris for the occasion, and there is an enthusiastic suggestion that Hawker may fly a Sopwith machine. The flying is to commence at 3 p.m., and the R.A.F. band will play in the enclosure.

The Martinsyde machine is being repaired and, according to a message from St. John's, it may be in condition to start again in about a fortnight's time.

It is probable that if it can be completed in time, another Handley Page, to be piloted by Mr. Clifford B. Prodder, may be entered.

The Vickers-Vimy-Rolls-Royce machine has arrived at St. John's, and is now being erected. It will probably start from the same aerodrome at Harbour Grace as the Handley Page.

Viscount Rothermere, president of the Anglo-Newfoundland Development Co., Ltd., has offered the use of the company's ships to transport aviators, aeroplanes, and spare parts to Newfoundland.

THE N.C. 4 ARRIVES AT LISBON

AFTER an interval of ten days the American flying-boat has succeeded in completing the second stage of her voyage across the Atlantic. She left Ponta Delgada (Azores) at 11.18 a.m. British summer-time on May 27, and arrived safely at 9.4 p.m. at Lisbon, a voyage of just over 800 miles. The route was marked by 14 destroyers. Commander

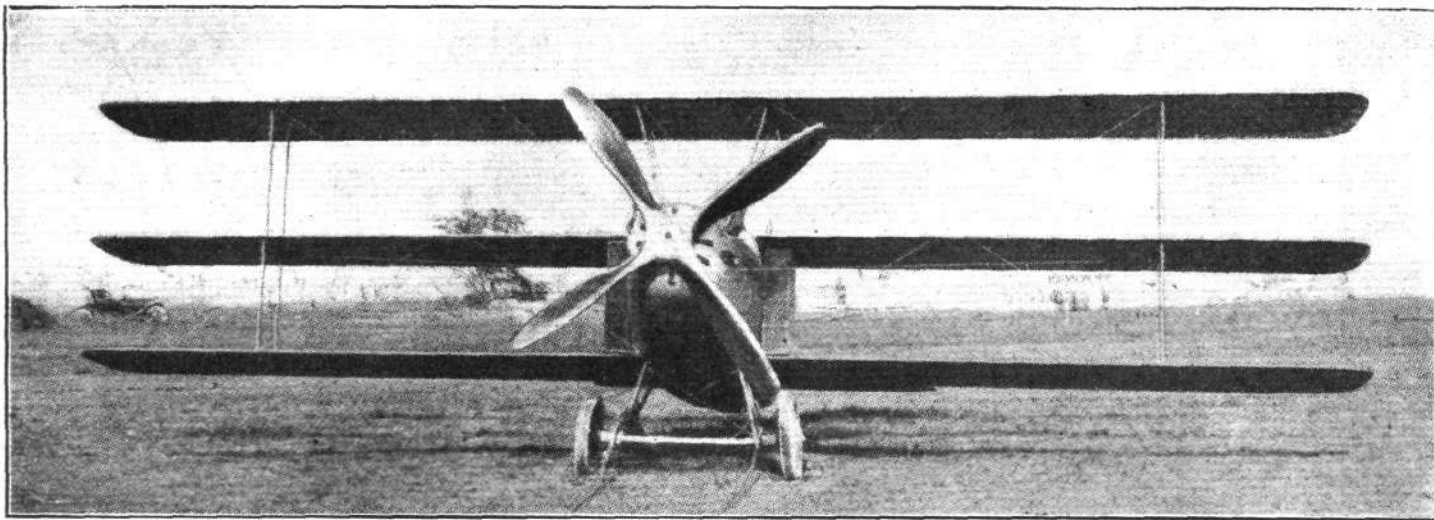
Read intends to complete his journey by flying to Plymouth.

Capt. Morgan, the navigator of the Martinsyde machine has probably lost the sight of his left eye as the result of the smash. He has been forced to retire from the contest, and another navigating officer will be appointed in his place.

THE CURTISS MODEL 18-T TRIPLANE

WE are able to give this week further particulars, with scale drawings (for which we are indebted to our American contemporary, *Aerial Age*), of the Curtiss 18-T triplane. Special attention to streamlining has resulted in the production of a machine which is not only pleasing to the eye, but is, at the same time, mechanically and aerodynamically efficient. The *fuselage* presents an almost continuous contour, whilst the tail units are so formed that they appear

between the middle and upper ones. They are braced by one pair of interplane struts a side, and the usual flying, landing, and incidence wires. The top plane is attached to a small centre section supported on the *fuselage* by four struts sloping outwards, whilst the middle and lower planes are attached to the top and bottom *longerons* of the *fuselage* respectively. The following are the main characteristics of the Curtiss 18-T:—

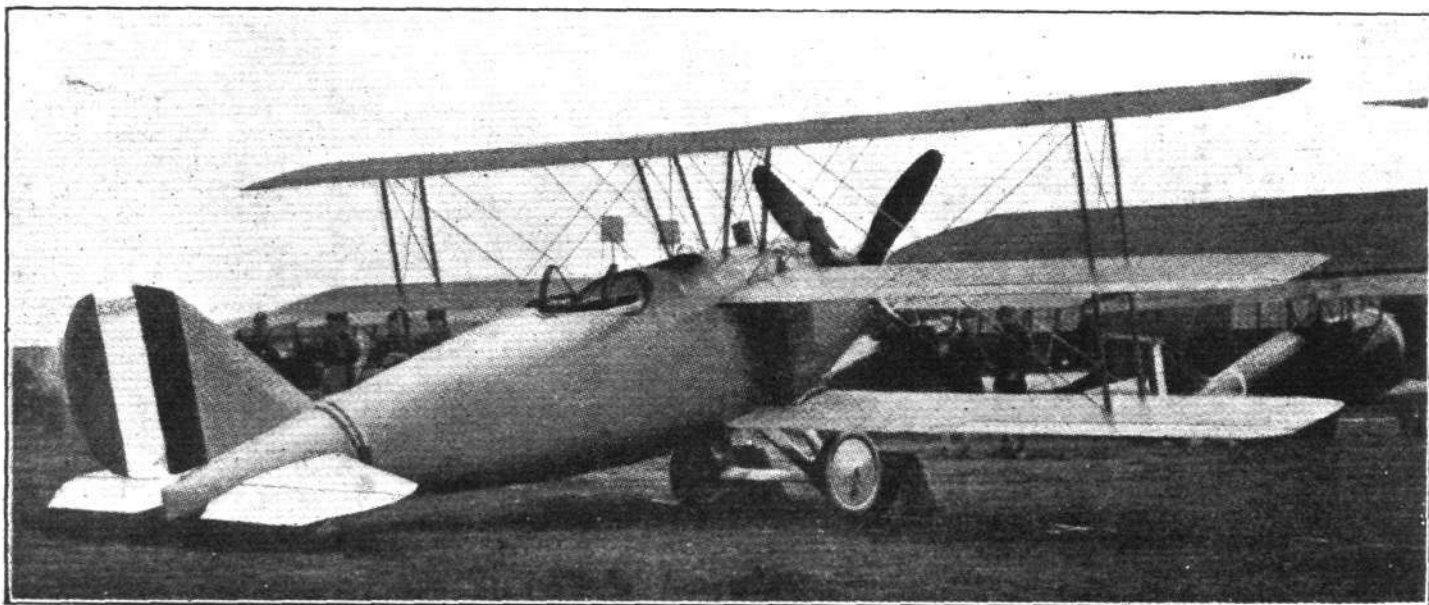


Front view of the Curtiss model 18-T triplane

as natural and expected extensions of the body, the engine cowling and exhaust manifolds completing the unity of the design. The machine is designed around the Curtiss K-12 400 h.p. engine (12-cyl. "V"), and the tractor screw is practically centred on the engine and *fuselage* by the location of the reduction gears integral with the engine. The tractor screw is either two or four-bladed, and is supplied

General Dimensions

Wing span (all three planes)	31 ft. 11 in.
Chord (all three planes)	3 ft. 6 in.
Gap between upper and middle	3 ft. 6 in.
Gap between lower and middle	2 ft. 11 ³ / ₈ in.
Overall length	23 ft. 3 ¹ / ₈ in.
Overall height	9 ft. 10 ³ / ₈ in.
Angle of incidence, mainplanes	2 ¹ / ₂ deg.
Angle of incidence, tail plane	5 deg.
Wing section	Sloan.

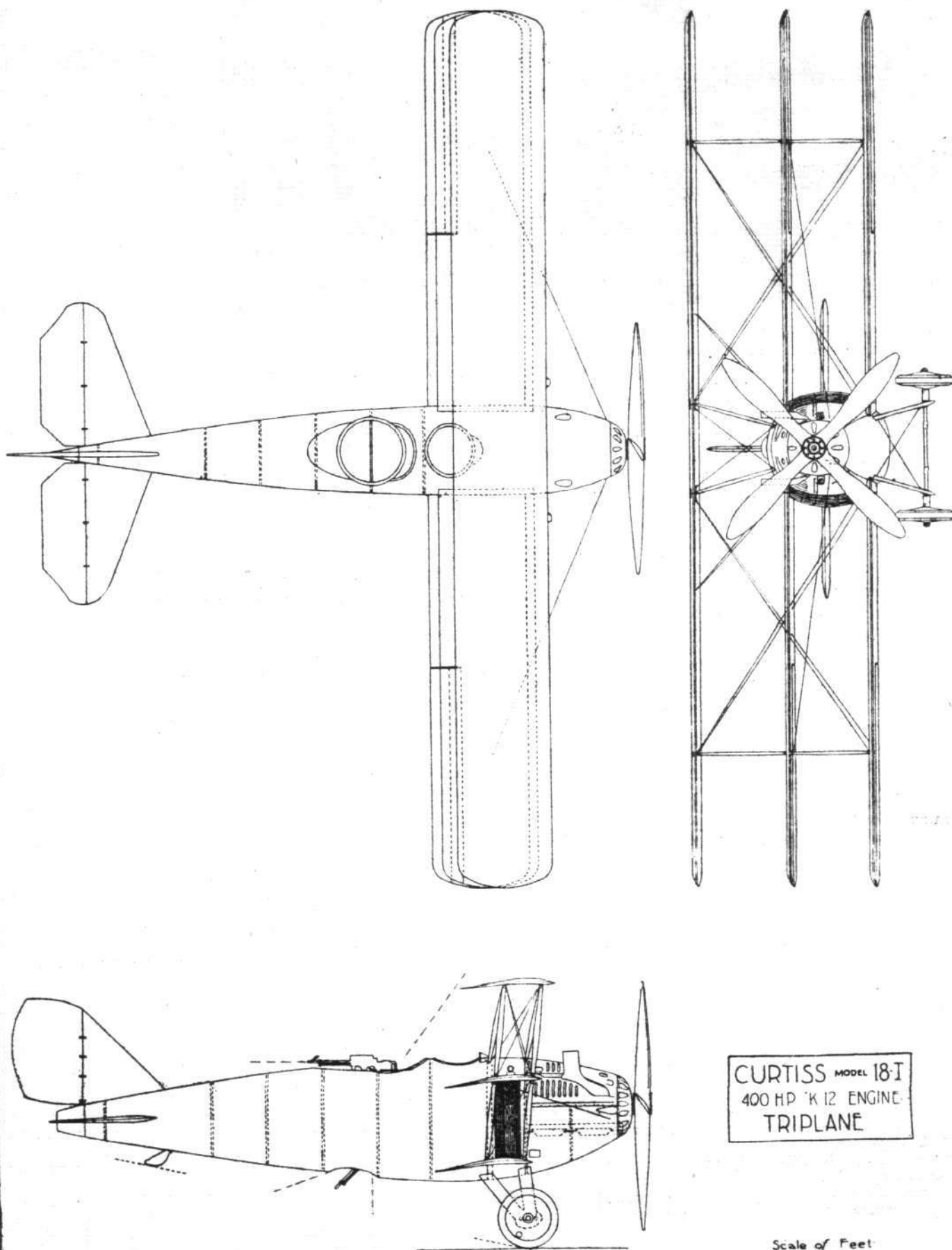


Three-quarter rear view of the Curtiss model 18-T triplane

according to requirements of performance. Standard instrument equipment includes a tachometer, oil gauge, petrol gauge, and complete set of tools.

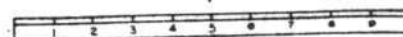
The main planes of this machine are of equal span and chord, but it will be noticed that gap between the middle and lower planes is slightly less than that

Areas (sq. ft.)			
Upper plane	112	Tail plane	14.3
Middle plane (minus ailerons)	87.71	Fin	5
Lower plane (minus ailerons)	87.71	Elevators (two)	13.02
Ailerons (four)	21.58	Rudder	8.66
		Total supporting surface	309



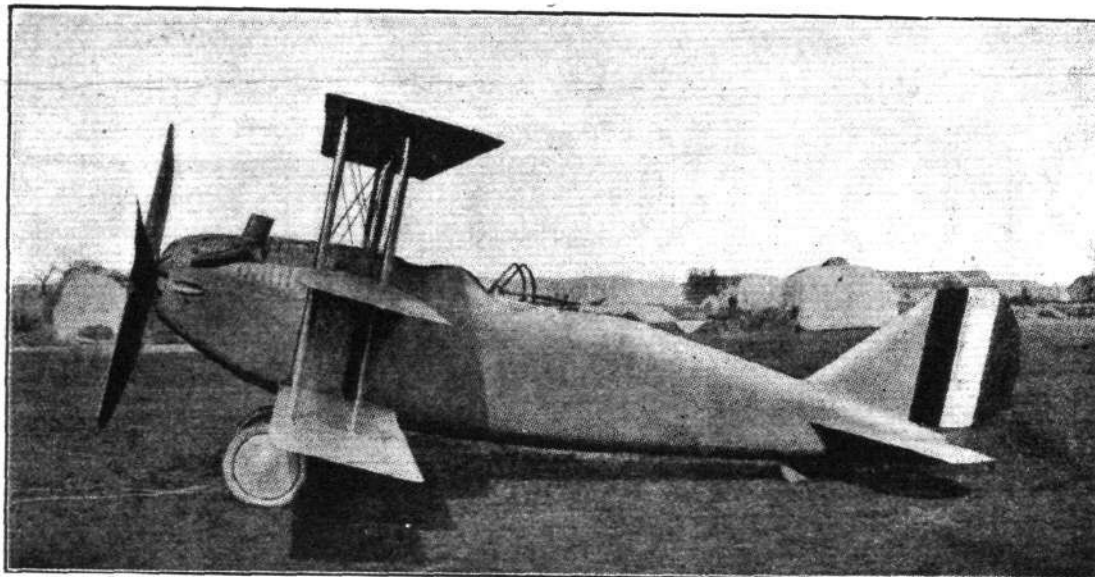
CURTISS MODEL 18-T
400 HP 'K 12 ENGINE
TRIPLANE

Scale of Feet



McLaughlin

THE CURTISS MODEL 18-T TRIPLANE.—Plan, side and front elevations to scale.



Side view of the
Curtiss model 18-T
Triplane

Loading and Weights (lbs.)	
Weight per sq. ft.	9.4
Weight per rated horse-power	7.25
Weight of machine, empty . .	1,825
Weight of machine, loaded . .	2,901
Weight of fuel (67 gals.) . .	400
Weight of oil (6 gals.) . . .	45

Weight of pilot and passenger	330
Useful load	301
Total useful load	1,076

Performance	
Speed range (m.p.h.)	58-163
Climb	15,000 ft.—10 mins.
Maximum range at economic speed	550 miles.

Power Unit	
Curtiss (K-12) 12-cyl. "V" water-cooled, 4½ in. by 6 in. . . .	400
H.P. at 2,500 r.p.m.	680 lbs.
Weight without fuel and oil . .	1.7 lb.
Weight per h.p.	36.7 gals.
Fuel consumption per hour . .	.55 lb.
Fuel consumption per b.h.p. . .	.03 lb.

THE ROYAL AERO CLUB OF THE U.K.

OFFICIAL NOTICES TO MEMBERS

Luncheon to Mr. H. G. Hawker and Lieut.-Commander K. M. Grieve, R.N.

THE Royal Aero Club will give a luncheon to Mr. H. G. Hawker and Lieut.-Commander K. Mackenzie Grieve, R.N., at the Savoy Hotel, on Friday, May 30, at 12-45 p.m. Members should apply for tickets at once to the Secretary, Royal Aero Club, 3, Clifford Street, W., as the accommodation is limited.

£10,000 Prize Offered by the Australian Government for a Flight from Great Britain to Australia (Under the Competition Rules of the Royal Aero Club.)

The Australian Government have offered the sum of £10,000 to be awarded to the pilot who shall first accomplish the flight in an aeroplane or seaplane from Great Britain to Australia in 720 consecutive hours.

The offer will remain open until midnight, December 31, 1920, by which date the flight must have been completed.

The complete aircraft and all its component parts must have been entirely constructed within the confines of the British Empire. Raw materials may be obtained from other sources.

The pilots and all crew must be of Australian nationality, in accordance with the laws of the Australian Commonwealth.

Entries.—Entries are to be made to the Royal Aero Club, 3, Clifford Street, London, W. 1. The entry form, which must be accompanied by the entry fee of £100, must be sent to the Secretary of the Club at least seven days before the start is made.

All entry fees received will be applied towards payment of the expenses of the Royal Aero Club in conducting the competition. Any balance not so expended will be refunded *pro rata* to the entrants.

Identification of Aircraft.—Only one aircraft may be used throughout the flight. Individual replacements and repairs to the aircraft and motors may be made *en route*, but neither may be changed as a whole. In the case of a seaplane, it may be taken ashore for such repairs and replacements. Five parts of the aircraft and five parts of each motor will be stamped or otherwise marked, and at least two marked parts of each of these five must be in place on arrival at the control and at the finishing point.

Starting Place.—The start must be made from Hounslow Aerodrome or Calshot Seaplane Station.

All starts must be made under the supervision of an official or officials appointed by the Royal Aero Club.

Finishing Place.—The point at which the competitor must

finish in Australia will be in the neighbourhood of Port Darwin, and will be announced later.

Control.—A Control Station will be established on the route of the flight at Singapore. Competitors must alight at this control for purposes of identification.

Towing.—Towing on the water is not prohibited, but the total distance of such towing must not exceed 100 miles, of which not more than 50 miles shall be consecutive.

Timing.—The time of starting will be the time the aircraft leaves the ground or water, and the time of arrival will be deemed to be the time of crossing the coast line in the neighbourhood of Port Darwin.

General

1. A competitor, by entering, thereby agrees that he is bound by the regulations herein contained or to be hereafter issued in connection with this competition.

2. The interpretation of these regulations or of any to be hereafter issued shall rest entirely with the Royal Aero Club.

3. The competitor shall be solely responsible to the officials for the due observance of these regulations, and shall be the person with whom the officials will deal in respect thereof, or of any other question arising out of this competition.

4. A competitor, by entering, waives any right of action against the Royal Aero Club or the Australian Government for any damages sustained by him in consequence of any act or omission on the part of the officials of the Royal Aero Club or the Australian Government or their representatives or servants or any fellow competitor.

5. The aircraft shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claim for injury either to himself, or his passenger, or his aircraft, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify the Royal Aero Club and the Australian Government in respect thereof.

6. The Committee of the Royal Aero Club reserves to itself the right, with the consent of the Australian Government, to add to, amend or omit any of these rules should it think fit.

The following entries for the above prize have been received:—

Bert Hinckler; Sopwith "Dove" biplane, 80 h.p. Le Rhone engine.

Lieut. C. Kingsford Smith and Lieut. V. Rendle; Blackburn "Kangaroo" biplane, two 250 h.p. Rolls-Royce Falcon engines.

Offices: THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W. 1.
H. E. PERRIN, Secretary.

THE AEROPLANE IN INDUSTRIAL DEVELOPMENT

A LECTURE under this title was delivered by Mr. G. Holt-Thomas before the Industrial Reconstruction Council at the Saddlers' Hall, Cheapside, recently, the Rt. Hon. Lord Balfour of Burleigh, K.T., being in the chair. In this lecture Mr. Holt-Thomas once again expressed his faith in commercial aviation, but pointed out that it is essential that we should realise the limitations of the aeroplane, and not put it to uses for which it is not suitable, a view which will be endorsed by everyone who is familiar with the subject and who has the future of aviation at heart. The bulk of Mr. Holt-Thomas's paper was taken up by statements of facts and opinions with which readers of *FLIGHT* are already familiar. There was, however, one subject dealt with in Mr. Holt-Thomas's lecture which is not quite so well known, and which is one of the very greatest interest. This is the linking up of the telephonic and telegraphic systems in one country with those of another country by means of aeroplane services. The following extracts from Mr. Holt-Thomas's lecture deal with this point.

"In talking about aerial routes I am chiefly talking about main routes to link up the world, and it is with this object that I have allied companies, practically all over the world, which are of national importance in each case. Undoubtedly other and subsidiary routes will shoot off from the main trunk routes; but in talking of these main or subsidiary routes we cannot ignore the existence of the present-day facilities such as railways, ships, telegraphs, and telephones. Therefore the air routes must be regarded as adjuncts to these facilities.

"The subject we have carefully thought out for more than a year, but about which I have not said anything until to-day, is the linking up of the telegraphic and telephonic systems in one country with the telegraphic and telephonic systems in another country by means of an aerial mail service; thus, in my opinion, making the existing systems of far greater value than they are to-day. The difficulty of communication, and also the expense, between France and England is not due to the telegraphic or telephonic system as it exists in either country, but to the relatively small output of words—for want of a better expression—which the cable between the two countries can deal with at any given time. And here, in talking of aerial routes, we are talking largely of the portage of words, and the number of words which can be carried by one aeroplane is enormous as compared with any cable. The term we have used in discussing this new system is the word 'aerogram' and by this we mean to signify a telegraphic or telephonic message which is carried by an aeroplane. Suppose, for instance, which is certainly the case, a man in Manchester has business dealings with a man in Lyons which necessitate daily messages passing between the two houses. Under our suggested system the man in Manchester would simply take up his telephone, call up our 'aerogram' office on the aerodrome near London, and dictate his message, which would be taken down in shorthand by one of our operators. This message would then be despatched to Paris by the next machine leaving; and, immediately on arrival, it would be telephoned direct from the Paris aerodrome into the office of the Manchester man's correspondent in Lyons. Thus a message could be conveyed in say three hours between the two offices in Manchester and Lyons, or elsewhere. You may say that he can wire direct. He certainly can, but it takes much longer, and will be more expensive. This system of 'aerogram' should bring the whole existing telegraphic and telephonic system of one country in direct communication with a similar system in another country simply by the use of this aerial link, and it is a very simple way of assisting the overloaded cable service. We claim that, on certain routes, provided there is a sufficient load, an aeroplane can carry more quickly, and more cheaply, any given number of words than is the case with the existing cable service.

"I am perhaps foolish to give away this idea to-day, as we claim that it is our own. We have discussed it for a long time, and have gone into it with experts on the subject; indeed a member of our staff, an expert on these matters, has devoted himself entirely to it. But I am so keen to show the great advantage of aerial transport that I cannot resist the temptation to exploit our ideas on this occasion which you have so kindly given me. It is, of course, a matter which we can only discuss at the moment, as the final decision is not in our hands, but in those of the Postmaster-General. Provided that the authorities in each country give every assistance, there is no reason why telephone and telegraphic messages should not be carried in this way by air; and it might be quite possible, for instance, as a time-saving device, to instal

at the aerodromes the punching machines which allow a telegraphic message to be received in the form of perforations on a tape, which could then without any other delay be immediately sent off by aeroplane. The connection between the aerodrome and large towns, might be made by a direct wire, which would of course reduce the period of transmission enormously. It is possible, in fact, to extend this system, with adaptations, to every part of Europe and even further, though I have simply discussed London-Paris as a practical example to-day.

"With this system of 'aerograms,' to take a definite instance, I think it is safe to say that a cable of 3,000 words, handed in at Paris and addressed to London, would, at a good average rate of transmission and from the time of the commencement of its despatch, take as long to reach London as a high speed aeroplane carrying millions of words would do.

"Incidentally it may be remarked that the economy of labour would be enormous. All the telegrams now exchanged between London and Paris, necessitating the employment of hundreds of telegraph operators, would represent merely a fraction of the load carried by these air-mail machines, piloted by not more than a score of men.

"The support given by the public first to the 'deferred' scheme (under which cable rates were halved for messages subjected to some small normal delay) and then to the week-end cable letter scheme, under which messages were subjected to a prescribed delay, sometimes for the greater part of a week, may, I think, be taken to indicate the boon to the public of rapid 'aerogram' services to distant parts of the world. The mention of facts like these, which are indeed facts, and not mere speculations, should, I think, convince my hearers of the value of the aeroplane, when it is used with a proper sense of its real and useful place in our scheme of transport. If it is not used with this very necessary discrimination, if it is attempted, as I am afraid it may be, to use it in direct competition with railways, as a passenger-carrier, before we have machines really suitable for this purpose, then I am certain that to do this will be to court not only failure, but also a loss of public confidence. To try to organise an air service as you would a railway service, to view one as a carrying service in very much the same light as you would the other, is quite absurd. The air service does something quite different from the rail service: it is supplementary to the railway and in no sense a direct competitor. Whereas the train as a traffic unit is large, the aeroplane is essentially small. Whereas the train must wait to accumulate a load, it should be possible with an air service, as I have already suggested, to maintain a very frequent service of small fast machines, each carrying a light load.

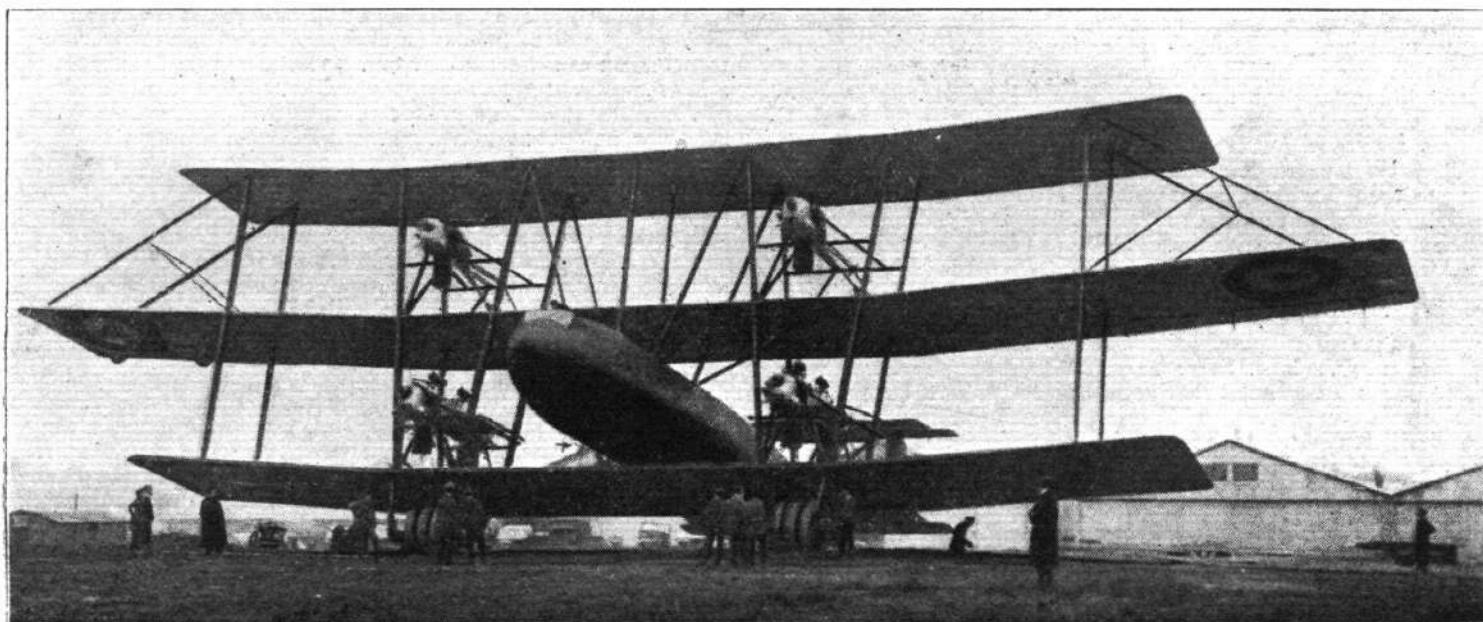
"Above all, as I see the problem, we do not want to try and prove too much at first. It makes me sad to see, in certain quarters, a tendency to repeat practically all the mistakes which have been made in the past in regard to the introduction of new methods of travel. And one of the greatest possible risks is to try and press forward faster than is reasonable or logical. Why should we want to build huge aeroplanes when we have not yet obtained any real commercial experience with the machines we have to-day? Why should we promise the public a great transocean service to-morrow when we have not yet gained much experience in the operation of one between London and Paris? We have a simply wonderful instrument in the aeroplane: one which is to play an enormously important part in all future trade developments. And we know that even with the machines we have to-day—which are only converted war machines and not commercial machines proper—we can so devise an air service that it will be of real benefit to the business world. And surely that should be sufficient. Why, when you have got something really good, try and induce people to believe that it is really better than it is? Why, by over-exploitation, risk an almost inevitable re-action? But there is no need for us to labour the point. I speak with some feeling, not so much from a personal point of view, but in the interests of the great movement it is my pleasure to serve. History teaches us lessons, and no history can teach us more than can the history of the introduction of our various forms of transport. And if we refuse to learn from the past—if, from self-interest, or from the desire to gain some temporary advantage, we deliberately shut our eyes to all these lessons of the past, then I think we are in a very bad case indeed."

It can scarcely be denied that Mr. Hall-Thomas has here outlined a sphere of usefulness of the greatest magnitude for the aeroplane, and one which could, and should, be taken advantage of immediately.—Ed.

THE TARRANT TRIPLANE

AFTER months of painstaking work, and having solved an endless succession of constructional problems those responsible for the large Tarrant "Tabor" triplane, have suddenly seen the results of their labours annihilated in the course of a few minutes by the accident which occurred on Monday last. Not only is the beautiful structure, for beautiful it was from a constructional point of view, whatever may have been one's opinion of the design, reduced to matchwood, but at least one of the men who had worked on the machine from the time of its inception has succumbed to the injuries sustained in the accident, while a second man, the pilot, is lying in a critical condition. We are sure that all readers of *FLIGHT* will join us in expressing our sympathy with the

engines running, and that, in order to get sufficient speed to rise, the pilot opened out the two top engines, which had up till then been throttled down, with the result that the extra thrust, applied so far above the centre of resistance of the machine, brought the tail up. The momentum thus imparted to the machine, especially that of the two top engines, was, at any rate momentarily, too great to be overcome by the tail planes and elevators, and the result was that the machine turned on to her nose. It is quite conceivable that had the machine been in the air the momentary pitching could have been corrected by trimming the tail, but on the ground there was no time in which to do this before the machine was over. By keeping cool to the last, the horror of a fire was avoided



THE TARRANT TRIPLANE.—View from the front

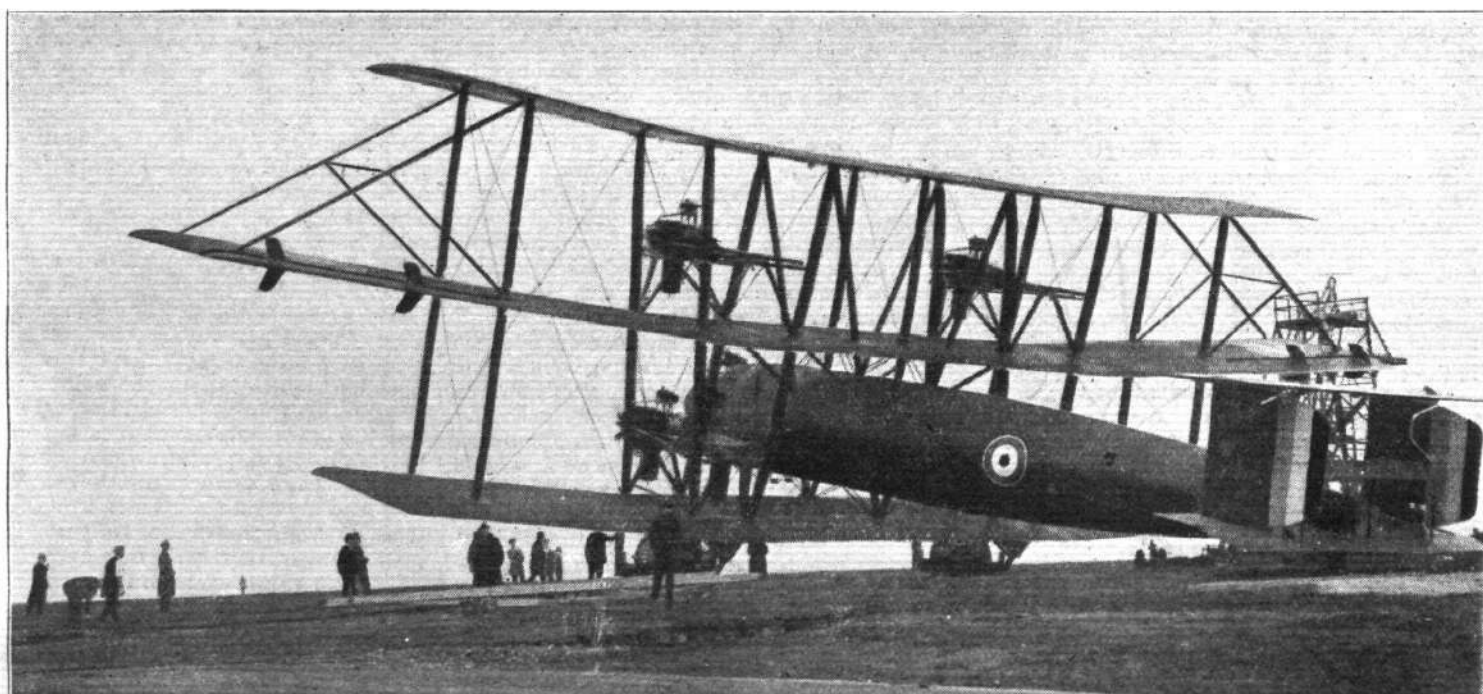
relatives of Capt. Rawlings, D.S.C., who died shortly after the accident, and with Capt. Dunn, A.F.C., who is still, at the time of writing, in a very critical condition. To Mr. W. G. Tarrant we also express our sincerest sympathy in the misfortune that has overtaken the machine into which, with rare courage, he had put so much thought and treasure. We understand that so certain is Mr. Tarrant that his principle is right that another machine will be put in hand immediately, incorporating, it may be taken, many alterations in design, but utilising the same constructional principle.

With regard to the accident itself, it is difficult to be certain of the exact cause, but it would appear that the machine was travelling along the ground at high speed with the four lower

engines running, and that, in order to get sufficient speed to rise, the pilot opened out the two top engines, which had up till then been throttled down, with the result that the extra thrust, applied so far above the centre of resistance of the machine, brought the tail up. The momentum thus imparted to the machine, especially that of the two top engines, was, at any rate momentarily, too great to be overcome by the tail planes and elevators, and the result was that the machine turned on to her nose. It is quite conceivable that had the machine been in the air the momentary pitching could have been corrected by trimming the tail, but on the ground there was no time in which to do this before the machine was over. By keeping cool to the last, the horror of a fire was avoided

by someone—probably one of the pilots, as there was a master switch in their cockpit—switching off the engines, otherwise the disaster might have been far greater than was the case. In addition to the two pilots, there were on board at the time of the accident the following:—Capt. T. M. Wilson, who, as the machine turned over, was flung into the rear part of the fuselage and sustained a broken leg; Lieut. Adams, engineer-in-charge, who accompanied Capt. Rawlings on the famous flight to Constantinople in a Handley-Page; Mr. Grosert, of the R.A.E.; two mechanics.

The injuries to the crew, with the exceptions of those sustained by the pilots, are not thought to be serious.



THE TARRANT TRIPLANE.—View from behind



The late Capt. P. T. Rawlings, D.S.C., the assistant pilot on the Tarrant triplane.

A tribute to Capt. Rawlings comes from Mr. Henry Edmunds, a life-long friend of the deceased officer. Mr. Edmunds writes:—

"May I, as an old friend of Percy Townley Rawlings, D.F.C., send you a few lines of appreciation? I knew Rawlings since his birth, his father and I being neighbours. He was

France Removes Restrictions

THE French Minister of War last week revoked the decree of July 31, 1914, which prohibited aerial navigation all over French territory.

No Landing Facilities at Cattewater

THE Air Ministry has issued the following statement:—

"It was intimated in a *communiqué* published on April 25 that Cattewater (near Plymouth) was one of the stations which it was proposed should be used jointly by Service and civil pilots as from May 1, when the ban on civil aviation was raised.

the youngest of three children (all sons) of the same generation as my own children. In early life his mother passed away.

"As a boy, Rawlings was always interested in scientific matters, particularly photography and motors. He was educated at St. Andrew's, Eastbourne, under the guidance of the Rev. E. L. Brown; then at St. Peter's, Westminster, where he gained a scholarship, and he afterwards acquitted himself with honours at Trinity College, Cambridge.

"He was manly, open, and frank, fearless and honest, of an enquiring mind, and fond of experimenting. I remember his pre-heating paraffin vapour electrically, as a fuel for explosive engines.

"Before the War, after leaving Cambridge, he trained as an engineer at Woolwich; and, later on, he had a Government appointment in the Soudan. His two brothers have each served their country, one in the Army throughout the War, the other in the Navy, where he is now Commander Rawlings.

"It was at my house at Brighton that Rawlings met Mr. W. G. Tarrant, who was spending the week-end with me. Rawlings had just returned from the famous flight in the Handley Page to Constantinople, where he bombed the 'Geben.' I remember his describing vividly his impressions of that memorable journey. If I recollect correctly, he motored down to Folkestone somewhat rapidly. He told me he believed the police were on the look-out for him for exceeding the speed-limit; but he went from Folkestone by air, proceeding to Naples. It was delightful to hear him recount that remarkable voyage. Their fears lest they should not be able to cross some of the high mountain ranges with the heavy load they were carrying, and where, had anything happened, they would have been out of the reach of all human aid. How he availed himself of a special camera for photographing portions of his trip, the results of which he feared it might be unwise to disclose at that time, so he brought the negatives back with him, and I believe they were kept personally until after the War.

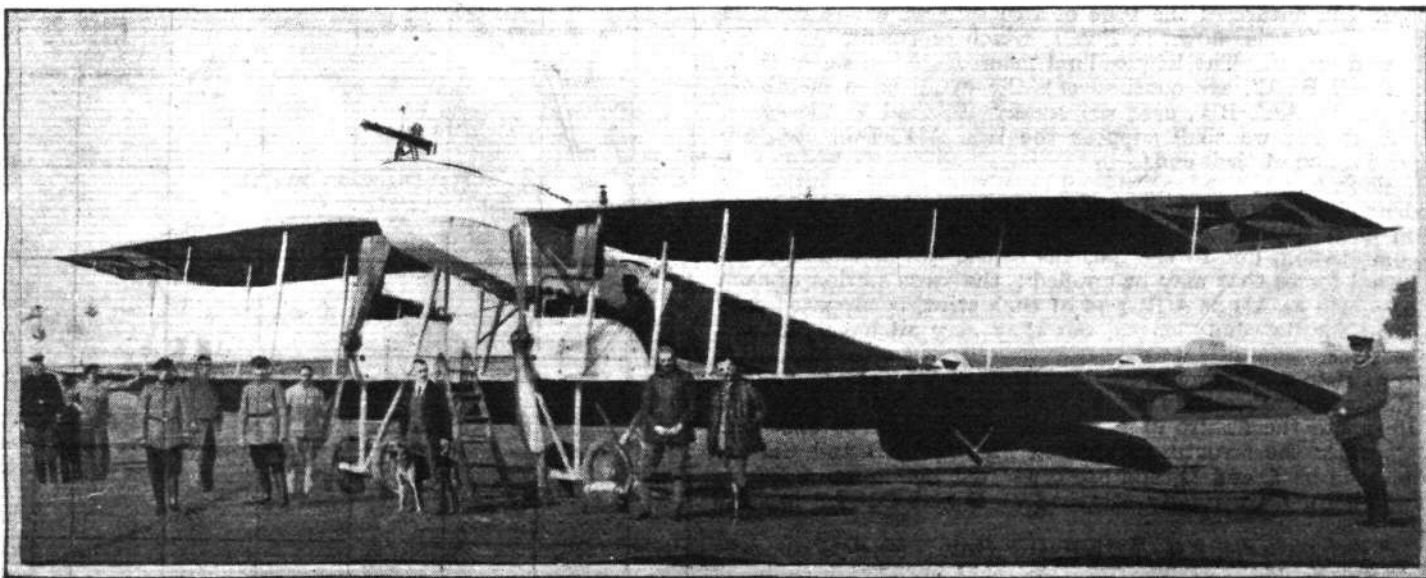
"He and Mr. Tarrant were mutually attracted to each other, and discussed with much seriousness the construction of a new type of bombing-plane, which eventuated in the great Tarrant machine. Rawlings joined Tarrant shortly afterwards, and devoted all his energies to carrying on the work of design and construction. On several occasions he came down to see me, and related his experiences. He was full of confidence as to the future of his work; and invited me to take my first flight with him.

"Townley Rawlings was a gallant gentleman. Those whom the gods love are taken early."

"It is necessary to point out that:—(1) Cattewater is at present in a prohibited area, being within the three-mile limit both of Devonport Dockyard and of Turnchapel railway station; (2) It is a seaplane base and not a land aerodrome, and therefore does not possess facilities for aeroplanes to land."

Relinquishment of Landing Grounds by R.A.F.

THE following aerodromes and landing grounds have been relinquished by the R.A.F.: Kilconquhar (Fifeshire), South Ash (Kent), Bellasize (Yorkshire), Stanstead (Hertfordshire), Telscombe (Sussex), Goldhanger (Essex), Bangor (Carnarvonshire).



A strange-looking Hun twin-engined bomber belonging to the Gotha family

THE STRESSES IN BRACED STRUCTURES WITH RIGID JOINTS

By JOHN CASE, M.A., A.F.Ae.S.

1. THE theory of the bending of a beam, under the combined action of a lateral distributed load and a longitudinal thrust or pull, has been well known for some time*; the inclusion of terminal couples is given by Johnson, Bryan and Turneure.† During the War the design of the wing spars of aeroplanes has led to a further extension of the theory to continuous beams loaded in the manner described; the results have been given in various forms, independently, by Messrs. H. Booth and H. Bolas, Mr. H. A. Webb, Mr. Arthur Berry, and the author, and a further investigation into the stability of such a beam has been given‡ by Messrs. Cowley and Levy. In the present paper I propose to extend the theory to the treatment, as a complete unit, of braced structures with stiff joints. The proposal has frequently been made that the inter-plane struts for aeroplanes should be attached rigidly to the spars, with the object of securing additional strength, and some designers even imagine that, by so doing, an "encastred" strut is obtained. With the development of all-steel wing structures for large aeroplanes it is not unlikely that this problem will have to be considered. The essential facts are soon brought out by a little con-

pinned at A and C. The loads are shown in the figure. The further particulars are:—

AB: $I = 6.0 \text{ in.}^4$;
CD: $I = 8.0 \text{ in.}^4$;
BC: $I = 0.7 \text{ in.}^4$; $A = 5.9 \text{ in.}^2$; $y = 0.75 \text{ in.}$

The three members are made of spruce, and we take $E = 1.4 \cdot 10^6 \text{ lbs./in.}^2$ for all.

We obtain the following results, in pound-inch units:—

		Joints at B and C.	
		Rigid.	Pinned.
Bending moment at A	..	9,540	10,200
" " D	..	12,570	13,500
" " B	..	1,340	0
" " C	..	1,360	0
Thrust in AB	..	292	250
" CD	..	3,545	3,520
" BC	..	359	337

It will be seen that the only serious effect of the rigid attachment at B and C is the introduction of the bending

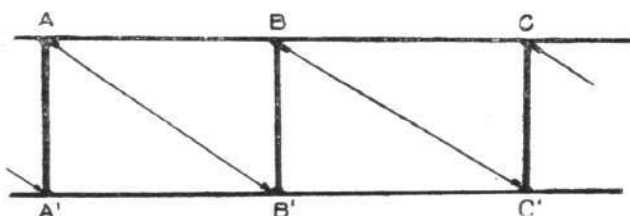


FIG 1

sideration; if the stiffness of the strut be small compared with that of the spars, the bending of the latter will not be greatly affected by the rigid attachment of the struts, but the spars will have considerable effect on the struts, to which they will apply terminal couples. The couples may not be great enough materially to affect the spars, but, the stiffness of the struts being supposed relatively small, the strength of the latter may be endangered. This is the most serious feature of the rigid attachment.

An example of the disastrous effect upon the struts will be found in the account§ of Major A. R. Low's optical experiments on the stresses in aeroplane wings; in one case the heel of one of the struts broke off under load. Another example occurred recently in the test of a full-size aeroplane; the attachment of the struts was semi-rigid, with the result that one broke at the end long before the spars were ready to fail.

On the other hand, if the stiffness of the struts be large compared with that of the spars, they will try to prevent the spars deflecting in the way they would, if left to themselves, under the action of the external loads; this may add considerably to the "fixing" moments on the spars at their points of attachment to the struts.

2. The nature of the type of structure which we propose to treat here is shown in Fig. 1, which represents part of a braced girder. The longitudinal members, or spars, A, B, C, and A', B', C', are continuous; the main cross members, or struts, AA', BB', etc., are rigidly attached to the spars, but at first we shall suppose the ties, AB', BC, etc., are pin-jointed at their ends.

Each bay of the longitudinal members carries a uniformly distributed vertical load, but the load need not be the same on each bay; each bay has also an end load, tension or compression, due to the tensions in the ties and to any external forces that may be applied; the cross section of each bay such as AB or A'B' and of each strut, is supposed constant for its whole length, but they may all have different sections.

3. Before entering upon the theory of the subject we give the numerical results of a very simple case, in order to illustrate the nature of the results which may be expected. Consider the structure shown in Fig. 2. AB and CD are built-in at A and D, and are connected by the strut BC, to which they are rigidly attached at B and C; AC is a tie

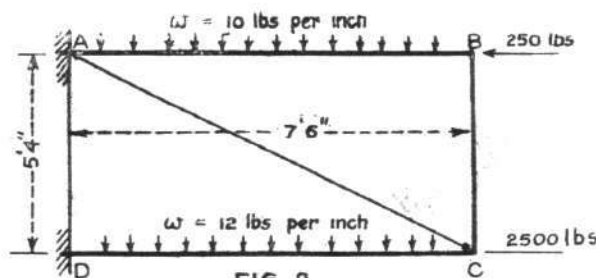


FIG 2

moments at the ends of the strut. If the strut be pin-jointed at the ends, its Euler crippling load is 2,400 lbs., or about seven times the load it has to carry. When the strut is fixed to the spars its failure depends on stresses, and not on elastic instability, and the stress in the strut is now 1,520 lbs./in.²; if the strength of the material in compression be 5,000 lbs./in.², we see that the strut will only stand up to about 3.7 times the load it has to bear, even if the stress be directly proportional to the load, which it is not. Thus the effect of fixing the strut to the spars is considerably to weaken the former. The effect on the spars is not important; the bending-moment diagrams for the two cases for AB, and also for the strut when the ends are fixed, are shown in Fig. 3.

4. Theory of Beam under the Action of a Distributed Load, End Load, and Terminal Couples.—It is not necessary to give here the details of the analysis, the methods of which can be found elsewhere,* but it will be convenient to collect the results for reference. The forms given here are prac-

* Johnson, Bryan and Turneure, loc. cit.

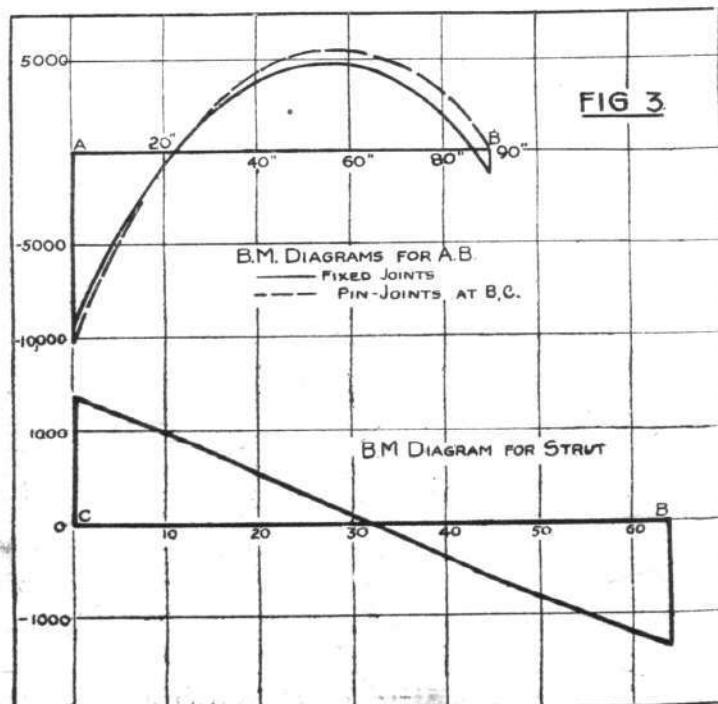


FIG 3

* Prof. Perry, *Phil. Mag.*, March, 1892; A. Morley, *Phil. Mag.*, June, 1908. The first exact treatment was published in 1880 by Manderla.

† *Modern Framed Structures*, Part ii.

‡ *Proceedings of the Royal Society*, January, 1918.

§ *Aeronautical Journal*, November, 1918, p. 360.

tically those given by Mr. Arthur Berry, which are the most convenient as the trigonometrical functions have been tabulated.

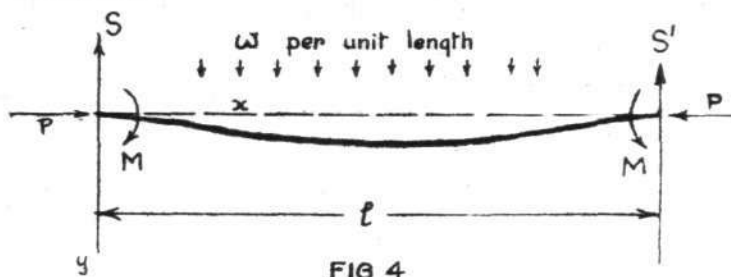


FIG 4

The loading is shown in Fig. 4; for the rest the notation is as follows:—

$$\alpha = \sqrt{\frac{P}{EI}} \quad \theta = \frac{\alpha l}{2} = \frac{l}{2} \sqrt{\frac{P}{EI}}$$

where E and I have their usual meaning. The deflection curve is given by

$$y = \frac{M}{P} \left[\frac{\sin \alpha(l-x)}{\sin \alpha l} - \frac{l-x}{l} \right] + \frac{M'}{P} \left[\frac{\sin \alpha x}{\sin \alpha l} - \frac{x}{l} \right] + \frac{w}{\alpha^2 P} \left[\sin \alpha(l-x) - (\sin \alpha l - \sin \alpha x) \right] \csc \alpha l + \frac{wx(x-l)}{2P} \quad (1)$$

The slopes at the ends are given by

$$\left[\frac{dy}{dx} \right]_{x=0} = \frac{Ml}{3EI} f_1(\theta) + \frac{M'l}{6EI} f_2(\theta) + \frac{wl^2}{24EI} f_3(\theta) \quad (2)$$

$$\left[\frac{dy}{dx} \right]_{x=l} = -\frac{Ml}{6EI} f_2(\theta) - \frac{M'l}{3EI} f_1(\theta) - \frac{wl^2}{24EI} f_3(\theta) \quad (3)$$

where

$$\left. \begin{aligned} f_1(\theta) &= \frac{3}{4} \frac{2\theta \operatorname{cosec} 2\theta - 1}{\theta^2} \\ f_2(\theta) &= \frac{3}{2} \frac{1 - 2\theta \cot 2\theta}{\theta^2} \\ f_3(\theta) &= 3 \frac{\tan \theta - \theta}{\theta^3} \end{aligned} \right\} \quad (4)$$

The bending-moment at any point is given by

$$A \cos \alpha x + B \sin \alpha x + \frac{w}{\alpha^2} \quad (5)$$

where

$$\left. \begin{aligned} A &= -\left(M + \frac{w}{\alpha^2}\right) \\ B &= \left(M + \frac{w}{\alpha^2}\right) \cot 2\theta - \left(M' + \frac{w}{\alpha^2}\right) \operatorname{cosec} 2\theta \end{aligned} \right\} \quad (6)$$

The position of the maximum bending moment is given by

$$\tan \alpha x = B/A \quad (7)$$

and its value is

$$M_{\max} = \sqrt{A^2 + B^2} + \frac{w}{\alpha^2} \quad (8)$$

The reactions at the points of support are

$$\left. \begin{aligned} S &= \frac{wl}{2} + \frac{M' - M}{l} \\ S' &= \frac{wl}{2} + \frac{M - M'}{l} \end{aligned} \right\} \quad (9)$$

If the end-load be a tension instead of a thrust, the following modifications are made:—

(i) The circular functions are replaced by hyperbolic functions.

(ii) Instead of P write -P.

(iii) Instead of α^2 write $-\alpha^2$.

(iv) Instead of f_1, f_2, f_3 , write $-f_1, -f_2, -f_3$, and inside the f 's \cot takes the place of \tan , etc.

The functions of f_1, f_2, f_3 , have been tabulated by Mr. Arthur Berry, both for circular functions and hyperbolic functions.

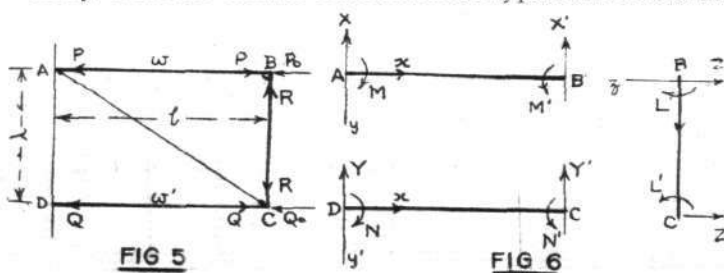


FIG 5

FIG 6

5. Analysis of the case given in 3.—Before proceeding to the general case we shall work out the case taken above as a simple example of the method.

In Fig. 5, the structure is shown complete; in Fig. 6 it

is represented as broken up into three separate beams for separate treatment. The notation is for the most part clear from the diagrams; for the rest we shall use, in the manner of 4, the following symbols:—

AB	CD	BC
$\frac{a}{\theta}$	$\frac{\beta}{\phi}$	$\frac{\gamma}{\psi}$
$\frac{I}{I_0}$	$\frac{I'}{I_0}$	$\frac{I''}{I_0}$

Then we have

$$I = M' \text{ and } L' = -N'$$

$$P = P_0 + X = P_0 + \frac{L' - L}{\lambda} = P_0 - \frac{M' + N'}{\lambda} \quad (10)$$

$$R = \frac{wl}{2} + \frac{M - M'}{l} \quad (11)$$

$$\begin{aligned} Q &= Q_0 + Z' + \frac{l}{\lambda} (R + Y') \\ &= Q_0 + \frac{l^2}{2\lambda} (w + w') + \frac{M + N}{\lambda} \end{aligned} \quad (12)$$

We must also have

$$\left[\frac{dy}{dx} \right]_{x=l} = \left[\frac{dz}{dx} \right]_{x=0} \quad \left[\frac{dy'}{dx} \right]_{x=l} = \left[\frac{dz}{dx} \right]_{x=\lambda} \quad \left[\frac{dy}{dx} \right]_{x=0} = 0 \text{ and } \left[\frac{dy'}{dx} \right]_{x=0} = 0.$$

Using equations (2) and (3) above we have:—

$$-\frac{Ml}{6I} f_2(\theta) - \frac{M'l}{3I} f_1(\theta) - \frac{M'\lambda}{3I_0} f_1(\psi) + \frac{N'\lambda}{6I_0} f_2(\psi) = \frac{wl^2}{24I} f_3(\theta). \quad (13)$$

$$-\frac{Nl}{6I} f_2(\phi) - \frac{N'l}{3I} f_1(\phi) + \frac{M'\lambda}{6I_0} f_2(\psi) - \frac{N'\lambda}{3I_0} f_1(\psi) = \frac{w'l^2}{24I'} f_3(\phi). \quad (14)$$

$$M f_1(\theta) + \frac{M'}{2} f_2(\theta) + \frac{wl^2}{8} f_3(\theta) = 0 \quad (15)$$

$$N f_1(\phi) + \frac{N'}{2} f_2(\phi) + \frac{w'l^2}{8} f_3(\phi) = 0 \quad (16)$$

Equations (10) to (16) determine the seven quantities, P, Q, R, M, M', N, N'. It should be noted here that in equations (13) to (16) we are assuming that the three members are made of the same material; if they are not I must be replaced by EI.

Unfortunately, these equations cannot be solved directly because θ, ϕ, ψ , are functions of P, Q, R, which are themselves functions of M, M', N, N', and we have to fall back on successive approximation. Usually two approximations are sufficient; we first take the values of P, Q, R, neglecting M, M', etc., and find the corresponding values of M, M', etc.; we then find the corrected values of P, Q, R, and again calculate M, M', N, N'; the values found this time are usually sufficiently accurate. The method will be illustrated by the example worked out below:—

If A and B (Fig. 5) be pin-joints, M and N are zero; equations (15) and (16) disappear, and M' and N' are given by

$$\left. \begin{aligned} -\frac{M'l}{3I} f_1(\theta) - \frac{M'\lambda}{3I_0} f_1(\psi) + \frac{N'\lambda}{6I_0} f_2(\psi) &= \frac{wl^2}{24I} f_3(\theta) \\ -\frac{N'l}{3I} f_1(\phi) - \frac{N'\lambda}{6I_0} f_1(\psi) + \frac{M'\lambda}{6I_0} f_2(\psi) &= \frac{w'l^2}{24I'} f_3(\phi) \end{aligned} \right\} \quad (17)$$

If the structure be continued symmetrically to the left of AB, equations (10) to (16) will still hold; the strut AD will have no end couples and will behave as if encastred.

6. Example.—We shall illustrate the method by working out the case cited in Section 3, where the necessary data will be found.

First Approximation.—Neglecting M, N, etc., we have

$$P = P_1 = 250. \quad Q = 2,500 + \frac{8100 \times 22}{128} = 3890. \quad R = 450.$$

Hence

$$\alpha = \sqrt{\frac{250}{1.4 \cdot 10^6 \cdot 6}} = 5.45 \cdot 10^{-3}; \quad \theta = \frac{\alpha l}{2} = 0.246 = 14.1''$$

$$\beta = \sqrt{\frac{3890}{1.4 \cdot 10^6 \cdot 8}} = 18.6 \cdot 10^{-3}; \quad \phi = \frac{\beta l}{2} = 0.839 = 48^\circ$$

$$\gamma = \sqrt{\frac{450}{1.4 \cdot 10^6 \cdot 0.7}} = 21.5 \cdot 10^{-3}; \quad \psi = \frac{\gamma \lambda}{2} = 0.688 = 39.4^\circ$$

From the trigonometrical tables we calculate :

$$\begin{array}{lll} f_1(\theta) = 1.017 & f_2(\theta) = 1.029 & f_3(\theta) = 1.025 \\ f_1(\phi) = 1.257 & f_2(\phi) = 1.464 & f_3(\phi) = 1.392 \\ f_1(\psi) = 1.154 & f_2(\psi) = 1.275 & f_3(\psi) = 1.234 \end{array}$$

Then equations (13) to (16) give :—

$$\begin{array}{lll} 2.58 M + 40.3 M' - 19.45 N' = -51,700. \\ 19.45 M' - 2.75 N - 39.9 N' = 63,400. \\ 1.017 M + 0.515 M' = -10,380. \\ 1.257 N + 0.732 N' = -16,900. \end{array}$$

And, solving these, we find

$$M = -9,700, M' = -1,310, N = -12,700, N' = -1,350.$$

Second Approximation.—Taking these values of the couples, we find for the corrected values of the thrusts :—

$$P = 291, Q = 3540, R = 357. \quad (18)$$

Proceeding as before we obtain :—

$$\begin{array}{ll} \alpha = 5.90 \times 10^{-3} & \theta = 0.266 = 15.3'' \\ \beta = 17.8 \times 10^{-3} & \phi = 0.800 = 45.9'' \\ \gamma = 19.1 \times 10^{-3} & \psi = 0.610 = 35'' \end{array}$$

and :—

$$\begin{array}{lll} f_1(\theta) = 1.02 & f_2(\theta) = 1.034 & f_3(\theta) = 1.029 \\ f_1(\phi) = 1.228 & f_2(\phi) = 1.409 & f_3(\phi) = 1.347 \\ f_1(\psi) = 1.116 & f_2(\psi) = 1.207 & f_3(\psi) = 1.176 \end{array}$$

The equations for the couples are :—

$$\begin{array}{lll} 2.59 M + 39.2 M' - 18.4 N' = -52,100 \\ 18.4 M' - 2.64 N - 38.6 N' = 61,200 \\ 1.02 M + 0.517 M' = -10,400 \\ 1.228 N + 0.705 N' = -16,350 \end{array}$$

which give :—

$$M = -9540, M' = -1,340, N = -12,570, N' = -1,360.$$

Taking these values we find :—

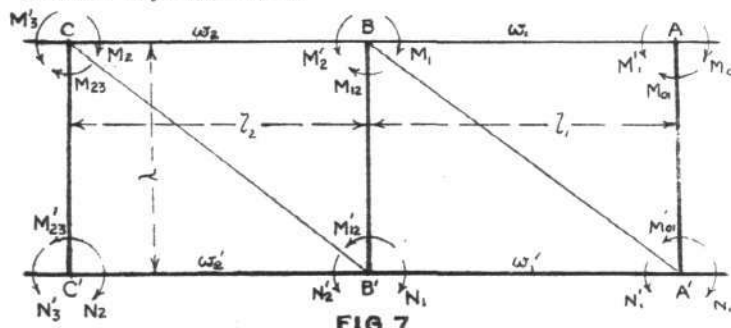
$$P = 292, Q = 3,545, R = 359,$$

which are sufficiently near to those from which we started the second approximation (18) to show that we need not proceed any further.

The bending moment diagrams for the three members are now easily plotted from (5) and (6); the results for the members AB and BC are shown in Fig. 3, together with the diagram for AB when the strut is pin-jointed.

The maximum bending moment on the strut is 1,360 lb. ins. This gives a stress due to bending = $1,360 \times 0.75 \div 0.7 = 1,460$ lbs./in.², and due to the thrust there is a stress = $359/5.9 = 61$ lbs./in.², so that the total compression stress is 1,521 lbs./in.²

7. General Equations.—We shall now deal with a structure of any number of bays, as shown in Fig. 7, where two consecutive bays are shown.



The notation for the bending moments is shown in the diagram; in addition we shall use $\theta_1, \theta_2, \dots; I_1, I_2, \dots; P_1, P_2, \dots; l_1, l_2, \dots$ for the longitudinal member of ABC...; $\phi_1, \phi_2, \dots; I'_1, I'_2, \dots; Q_1, Q_2, \dots$ for the A'B'C'...; $\psi_1, \psi_2, \dots; I_{12}, I_{23}, \dots; R_{12}, R_{23}, \dots$ for the cross members such as BB'.

The shearing forces at the end of each member, considered as a separate beam, are denoted in the same manner as in Fig. 6; X_1, X'_1, \dots are used for the upper beam; Y_1, Y'_1, \dots for the lower beam; Z_{12}, Z'_{12}, \dots for the cross members. Then we have :—

$$\left. \begin{array}{ll} X_1 = \frac{w_1 l_1}{2} + \frac{M'_1 - M_1}{l_1} & X'_1 = \frac{w_1 l_1}{2} + \frac{M_1 - M'_1}{l_1} \\ Y_1 = \frac{w'_1 l_1}{2} + \frac{N'_1 - N_1}{l_1} & Y'_1 = \frac{w'_1 l_1}{2} + \frac{N_1 - N'_1}{l_1} \\ Z_{12} = \frac{M'_{12} - M_{12}}{\lambda} & Z'_{12} = \frac{M_{12} - M'_{12}}{\lambda} \end{array} \right\} \quad (19)$$

etc., etc.

If the last complete bay to the right be denoted by the suffix i , then in the n th bay from that end, we have

$$P_n = [P_n]_0 - \frac{1}{\lambda} \sum_{i=1}^n \left[(M_{n-1} - M'_{n-1}) + (N_n - N'_n) + (M_{n-1, n} - M'_{n-1, n}) \right] \quad (20)$$

where $[P_n]_0$ denotes the value of P_n when the structure is pin-jointed. Similarly :—

$$Q_n = [Q_n]_0 + \frac{1}{\lambda} \sum_{i=1}^n \left[(M_n - M'_n) + (N_n - N'_n) + (M_{n-1, n} - M'_{n-1, n}) \right] \quad (21)$$

and

$$R_{n-1, n} = [R_{n-1, n}]_0 + \frac{M_n - M'_n}{l_n} + \frac{N_{n-1} - N'_{n-1}}{l_{n-1}} \quad (22)$$

The equations are easily verified.

Now, considering two contiguous bays, such as those shown in Fig. 7, we must equate the slopes of AB, B'B, and BC at B. Using the results (2) and (3), and paying due respect to signs, we obtain the equations :—

$$\begin{aligned} \frac{M_1 l_1}{3 I_1} f_1(\theta_1) + \frac{M'_1 l_1}{6 I_1} f_2(\theta_1) + \frac{w_1 l_1^3}{24 I_1} f_3(\theta_1) \\ = -\frac{M_2 l_2}{6 I_2} f_2(\theta_2) + \frac{M'_2 l_2}{3 I_2} f_1(\theta_2) - \frac{w_2 l_2^3}{24 I_2} f_3(\theta_2) \\ = \frac{M_{12} \lambda}{3 I_{12}} f_1(\psi_{12}) + \frac{M'_{12} \lambda}{6 I_{12}} f_2(\psi_{12}) \end{aligned} \quad (23)$$

Similarly at B we obtain :—

$$\begin{aligned} \frac{N_1 l_1}{3 I'_1} f_1(\phi_1) + \frac{N'_1 l_1}{6 I'_1} f_2(\phi_1) + \frac{w'_1 l_1^3}{24 I'_1} f_3(\phi_1) \\ = -\frac{N_2 l_2}{6 I'_2} f_2(\phi_2) - \frac{N'_2 l_2}{3 I'_2} f_1(\phi_2) - \frac{w'_2 l_2^3}{24 I'_2} f_3(\phi_2) \\ = -\frac{M_{12} \lambda}{6 I_{12}} f_2(\psi_{12}) - \frac{M'_{12} \lambda}{3 I_{12}} f_1(\psi_{12}) \end{aligned} \quad (24)$$

And we also have the equations :—

$$\begin{array}{l} M_{12} = M'_1 - M_2 \text{ etc.} \\ M_{12} = N_2 - N'_1 \end{array} \quad (25)$$

The systems of equations (20) to (25) are sufficient to obtain all the couples and end-loads.

In the event of any of the members being in tension, the modifications mentioned in Section 4 must be made. If any members have no end-load, the f 's for that member all become unity. The equations can easily be extended to include cases where all the bracing members are rigidly jointed, and the upper and lower spans are unequal, as, for example, a Warren girder. If external couples are applied at the points A, B, C, etc., equations (25) must be modified accordingly.

8. The Effect of the Stretching of the Ties.—In the above work we have neglected the fact that the ties stretch, thereby allowing a vertical movement of the cross members or struts. Usually this effect is not important, but it may be allowed for, if desired, by making the following modifications to the theory.

(1) In Sections 4 and 5, if δ denote the amount by which the end of B sinks below A, neglecting the changes of length of the members AB, BC, CD, δ is given by—

$$\delta = \frac{Y + R}{EA} \sqrt{E^2 + \gamma^2} \quad (26)$$

where A is the area of the cross-section of the tie.

Then :—

(a) To the expression for y , (1), add $\frac{\delta}{l}$.

(b) To the expression for $\frac{dy}{dx}$ add δ/l in (2) and (3).

(c) In the expressions for the reactions at the ends, to S' add $P\delta/l$; from S subtract $P\delta/l$.

(d) The equations (5) to (8) for the bending moment are unaltered.

(e) To the left-hand side of equations (13), (14), (15) and (16) add the term $\frac{\delta}{l}$.

(2) In the general equations of Section 7, the expressions for the reactions (19) must be corrected as indicated in (1) c above, and—

To the first line of equations (23) and (24) add δ_{12}/l .

To the second line of equations (23) and (24) add δ_{01}/l , where δ_{12} is the amount by which B sinks below C, and δ_{01} the amount by which A sinks below B; δ_{12} and δ_{01} are given by expressions similar to (26) above.

An Air Raid in the Caspian.

DETAILS have only just been made known of a raid by British aircraft which occurred in the Caspian on May 10. From their base at Baku, the machines proceeded to Astrakhan, a distance of more than 400 miles, and bombed the

Bolshevik fleet and arsenal there. Several hits were observed and fires were seen to break out. The Bolshevik fleet in Astrakhan consists of ten small destroyers and two submarines. The submarines have been out, but they always discreetly vanish when the British flotilla on the Caspian appears.

AIRISMS FROM THE FOUR WINDS

THE final touches have been given in Paris to the International Air Convention Regulations, the Aeronautical Commission of the Peace Conference having held its final meeting on May 22, and the publication of the text, which will consist of 56 pages, will take place very shortly. The Convention will be submitted to the Supreme Council as an appendix to a final report, summarising the work of the Commission.

THE Convention itself deals with the following matters:—
 (a) General principles governing the rights of international flight.

(b) The nationality and registration of aircraft.
 (c) Certificates of air worthiness and competency.
 (d) Principles governing flight over foreign territory.
 (e) Rules to be observed on departure or landing and when under way.

(f) Prohibition of the carriage of certain objects.
 (g) State aircraft.
 (h) The international commission for air navigation.
 (j) Final provisions.

Technical details are dealt with in annexes in the following order:—

A. The marking of aircraft.
 B. Certificates of air worthiness.
 C. Log books.
 D. Rules as to lights and signals and rules of the air.

E. Certificates of competency including medical requirements.

F. International maps and ground marks.

G. Meteorological information.

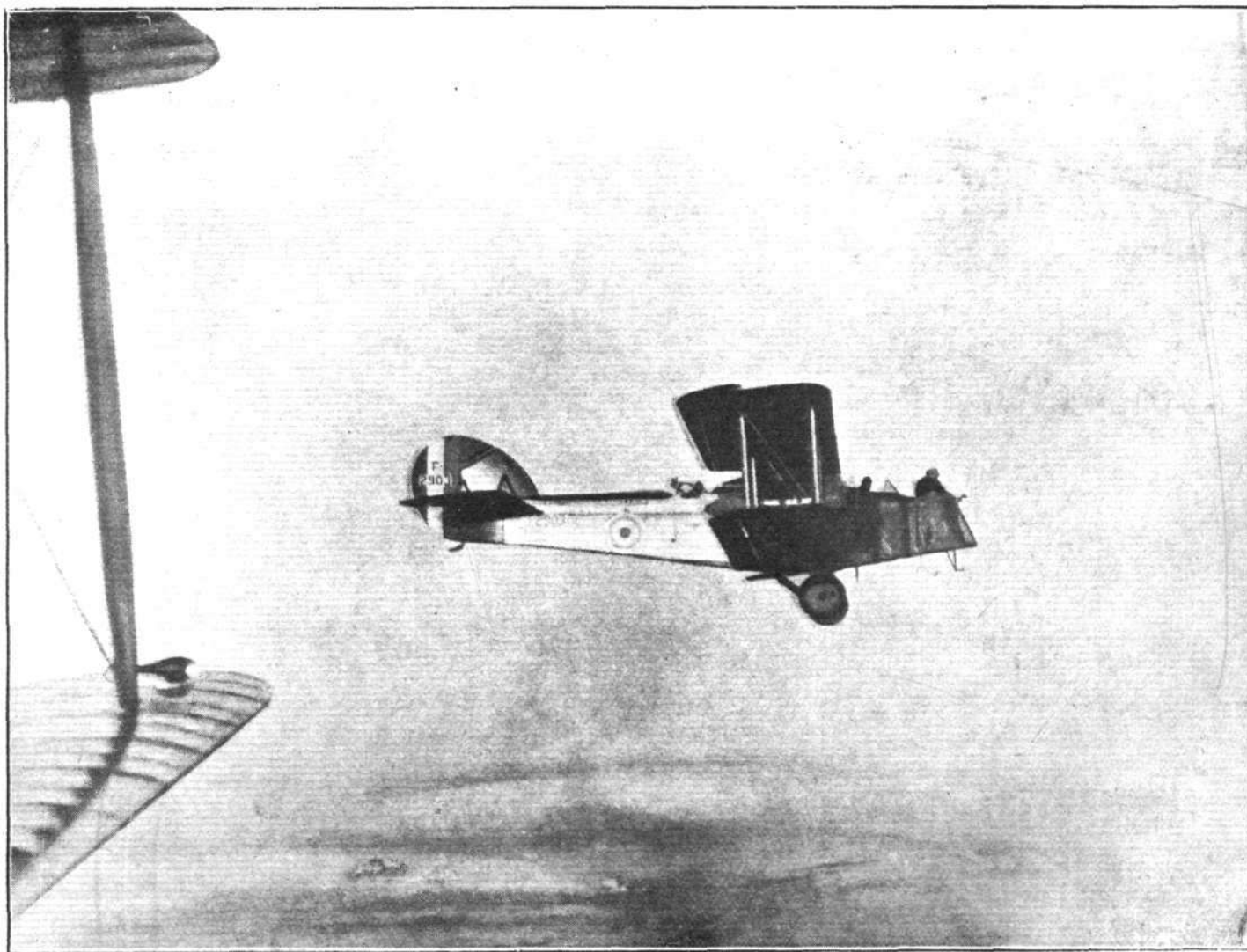
H. Customs.

The preparatory work of drafting the convention was in the main divided between two sub-committees, the legal, financial, and commercial sub-committee being responsible for the text of the convention and of Annex H, and the technical sub-committee for the text of the technical annexes A to G. The commission itself, however, has been responsible for the final approval of the different drafts, with the help of a small drafting committee.

NOTE.—The R.A.F. picture exhibition in colours at the Grafton Galleries closes this week, on Saturday. Just time for a final look round this remarkable show.

By air to the Derby for 2½ to 3 guineas sounds almost too reasonable for a start off. But that is the figure at which it is proposed to convey passengers at, by one of the travel agencies which have taken up flying as a commercial side to their business.

WITHOUT doubt in the event of the Germans refusing to sign the peace terms, Berlin could be easily and effectively bombed. The effect upon the population would, without question, be immediate and drastic, but at the same time



THE BOULTON AND PAUL "BOURGES."—A "snap" from another aeroplane during a test flight

we scarcely care to think that such a course would be taken by the Allies under all the circumstances of the present position. This in spite of "discussions" upon this subject which are reported to have taken place between British air officers and the chiefs of the American Air Service. The Huns might then have cause for appealing to humanity in the matter, with the chance of having a sympathetic hearing, in spite of all the beastliness of which they have been guilty.

SOME funny facts appear now to be emerging in regard to the actual state of American equipment of their troops in France, even up to the time of the Armistice. Many shortcomings are being criticised pretty freely by men who know, and one of the latest comes from Capt. Archie Roosevelt, son of the late Ex-President, and from Capt. Edward Rickenbacker, America's "Ace of Aces," with 26 air victories to his score. After some scathing comments upon U.S. staff-work, the uniforms, the artillery, which largely were anything but American, Capt. Roosevelt states that the aeroplanes were generally condemned French machines. He is supported by Capt. Rickenbacker, who declares in his book, "Fighting the Flying Circus," that the few American aviators of the willing thousands who finally got to the front flew in unfit machines, because there were no others. Because the French had discarded the Nieuport flyer for the stronger Spad, the American Government was able to buy a few out-of-date machines for the American pilots, or go without. Consequently the American pilots were obliged to venture out in the Nieuports against far more experienced pilots in modern machines.

"None of us in France," Capt. Rickenbacker continues, "could understand what prevented our great country from furnishing machines equal to the best in the world. Many a gallant life was lost to American aviation during the early months of 1918, the responsibility for which must lie heavily on some guilty conscience." He then refers to "the clumsy Liberty machines, which, with their criminally-constructed fuel tanks, offered so easy a target to the incendiary bullets of the enemy that their unfortunate pilots called this boasted achievement of our Aviation Department their 'flaming coffins.'"

AFTER all our Air Ministry did a bit better than that, and didn't boast about it either . . . over-much.

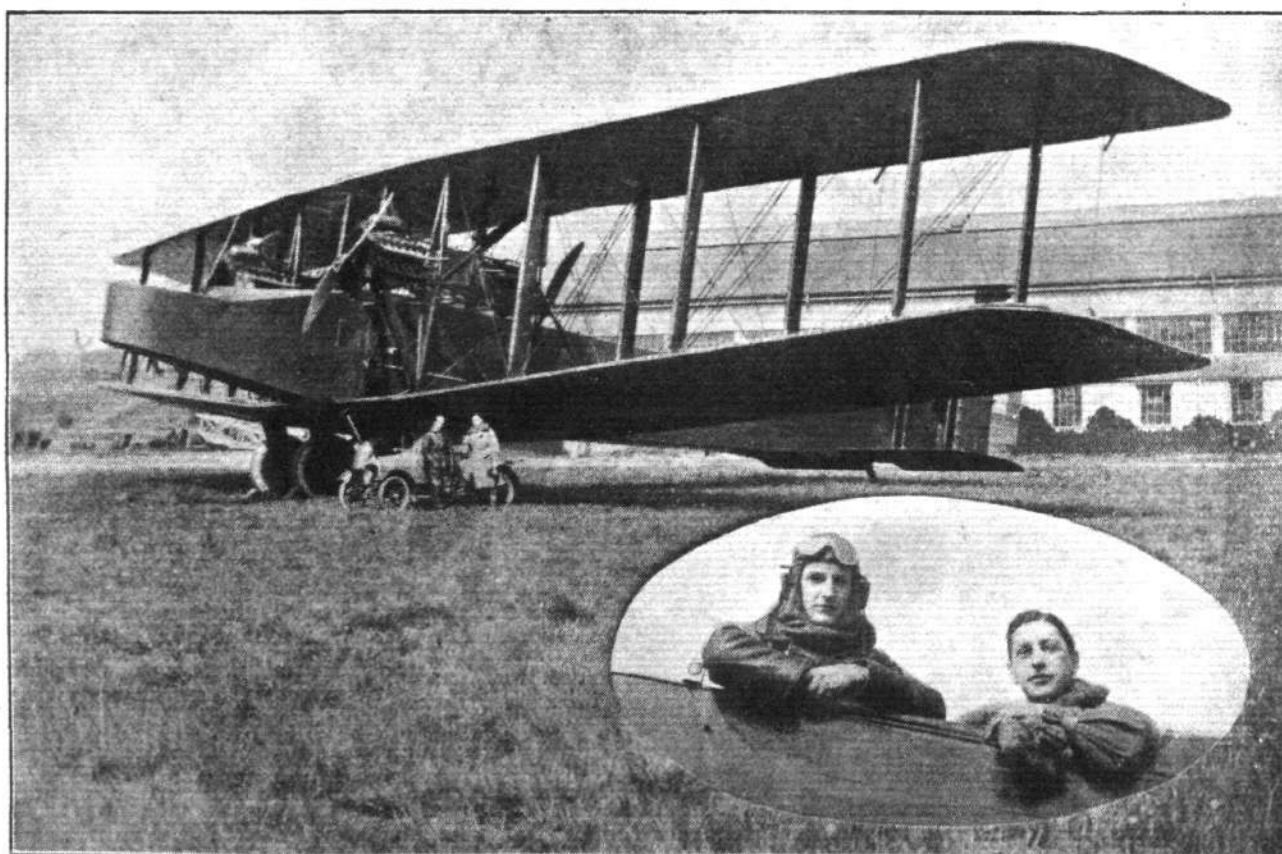
TO what end—except as an acrobatic performance—is Lieut. O. Locklear perpetrating at Atlantic City the fantastic



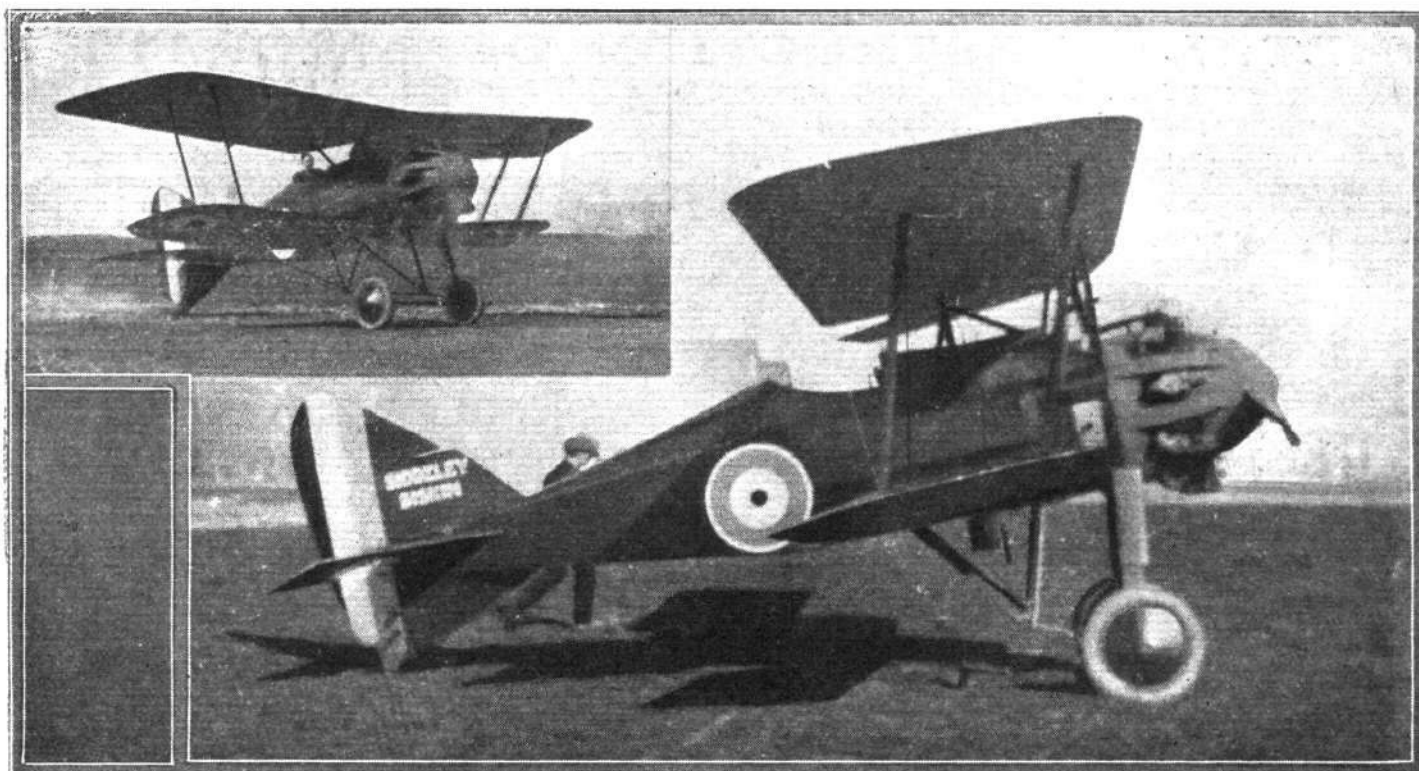
"Flight" Copyright.

AT HOUNSLOW AERODROME: A "Civilian," Master Baker, books his own guinea flight.

stunts with which he is credited, before thousands of visitors to the Pan-American Aeronautical Convention? This very intrepid ex-U.S. Army Air Service officer, it is stated, demonstrated the possibility of passing from one aeroplane to another while in flight by catching a ladder dangling from the plane passing overhead. Both planes were at an altitude of 2,500 ft. Lieut. Locklear claims previously to have dropped from a higher to a lower plane while in flight, but this is the first time he has mounted to a higher plane. It seems possible, if he persists in this somewhat superfluous



BELFAST TO FOLKESTONE NON-STOP FLIGHT.—The Rolls-Royce engined Handley Page which made the trip, at Folkestone, with the pilot, Mr. Clifford P. Prodger (left), and one of the passengers, Mr. Bernard Isaac



THE SIDDELEY "SISKIN."—A couple of snaps taken recently. This machine possesses several unusual features. Thus the undercarriage is of the Oleo type. The top plane is slightly larger than the lower one, and the inter-plane struts are raked. The engine is a 340 h.p. A.B.C. "Dragonfly."

feat, he may mount to a still higher plane, from which there is no return.

Poison gas was quite clever—from the German point of vision—so long as the Huns only were using it on the Allies. But when they had to take their own medicine and a bit more, then indeed were we all that was inhuman. Yet they apparently only just missed the best part of the retaliation begotten from their own initiation, as details of the deadliest poison the world has ever known, which at the time of the signing of the armistice was being manufactured at the rate of three tons a day for use against the Germans, have just been revealed, says the *New York Times*. Its name is Lewisite. It is the discovery of Professor Lee Lewis, of the United States Bureau of Mines.



A Snow-Drop

Ten aeroplanes, it is stated, could have carried enough Lewisite to wipe out every trace of animal and vegetable life in Berlin. A single day's output would kill every human being in New York. Even a drop poured on the hand, it is said, would penetrate to the blood and reach the heart, causing the victim to die in agony.

REALLY it is almost a pity some of this pretty little condiment could not have been tried on the enemy. But that's just his luck. Anyway, if this sort of thing spells progress, hardly further argument is required for our maintaining supremacy in the air. Shall anyway be curious to learn its nature. Has it, we wonder, any relation to some intense extract of Government War sausage or butter?

METAL CONSTRUCTION OF AIRCRAFT

BY A. P. THURSTON, D.Sc., F.R.A.E.S., F.R.MET.S., M.I.A.E.

(Continued from page 684)

FIGS. 12 to 14 show photographs of the modified fittings of the Rudge spars.

In this case the lift and anti-lift wires are pivoted to the central tube. The photographs are self-explanatory.

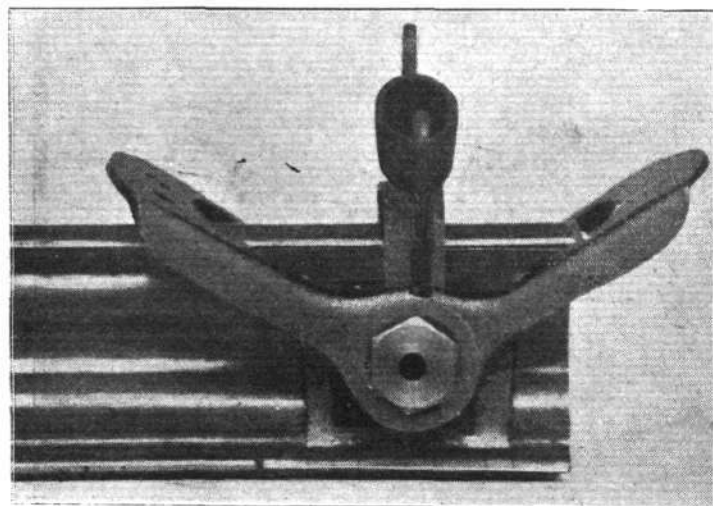


Fig. 12.

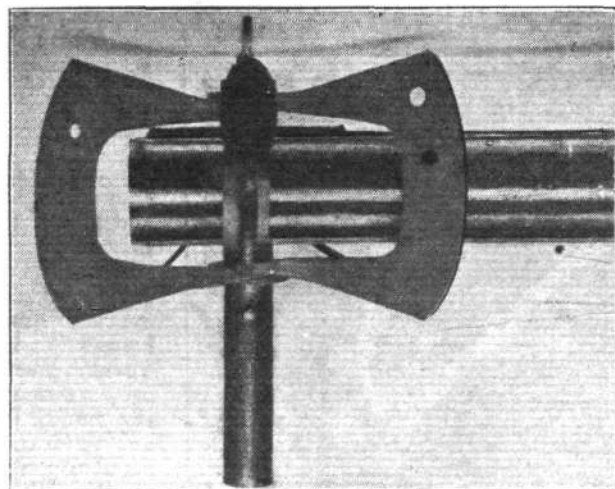


Fig. 13.

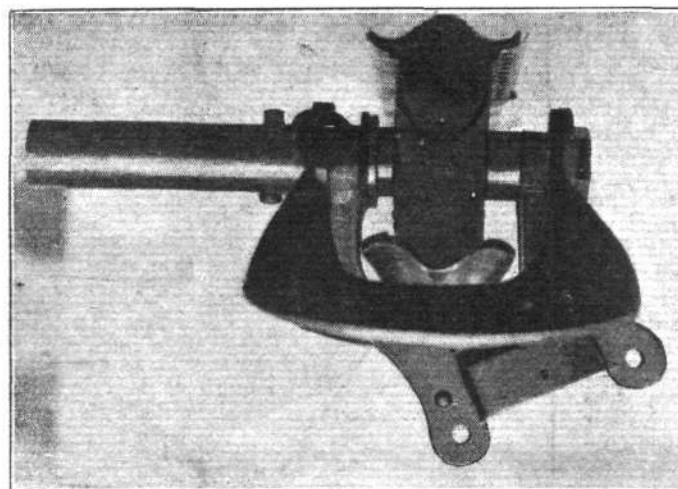


Fig. 14.

Boulton and Paul Spars

Very interesting experiments have been carried out by Boulton and Paul with a modified type of Rudge spar shown in Fig. 15.

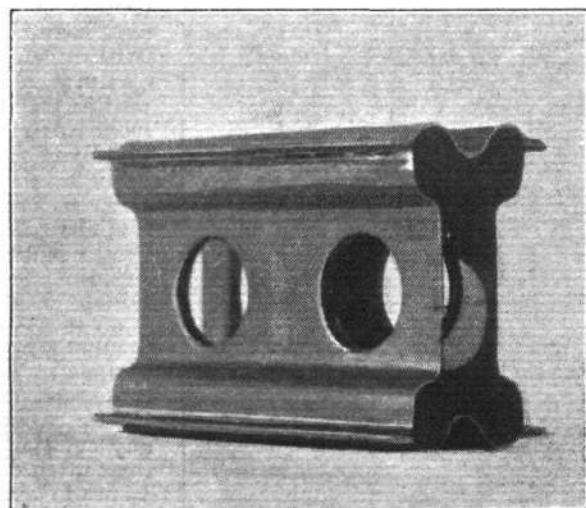


Fig. 15.

The flange is provided with two corrugations having flat horizontal edges. The centre portions of the webs are stamped with flanged holes as in the early Rudge spars, and are provided with longitudinal corrugations above and below these holes. The edges of the web are doubled over to embrace the flat edges of the flanges, and the spar is completed by suitably placed rivets. This spar is extremely efficient under test. A spar made from material whose ultimate tensile strength was given by the manufacturers as 40 tons, developed a stress of 43.5 tons per square inch in the flanges before failure. It is claimed that this spar is 12 per cent. lighter than a spruce spar and will sustain 70 per cent. increased bending moment. The first specimens were rolled from 40-ton steel .018-in. thick. Flanges of steel with higher tensile strength are now used, and the ultimate strength of the flanges is developed simultaneously with the ultimate shear stress of the webs.

Fig. 16 shows an early specimen in shackles, taken after testing to destruction. The flange of this specimen is provided with a single shallow corrugation, and failed before the full strength of the specimen had been developed. The dent in the flange shows where the spar failed.

Fig. 17 shows a photograph of a complete pair of wings provided with Boulton and Paul spars.

Humber Spars

The spars previously described have been made from rolled strip. A second alternative is to construct spars from

metal sheet which can be obtained in lengths up to 10 ft. from firms such as Sankey's and Firth's.

Valuable and useful work has been carried out in developing this form of construction by Col. J. A. Cole and Mr. Nibblet,

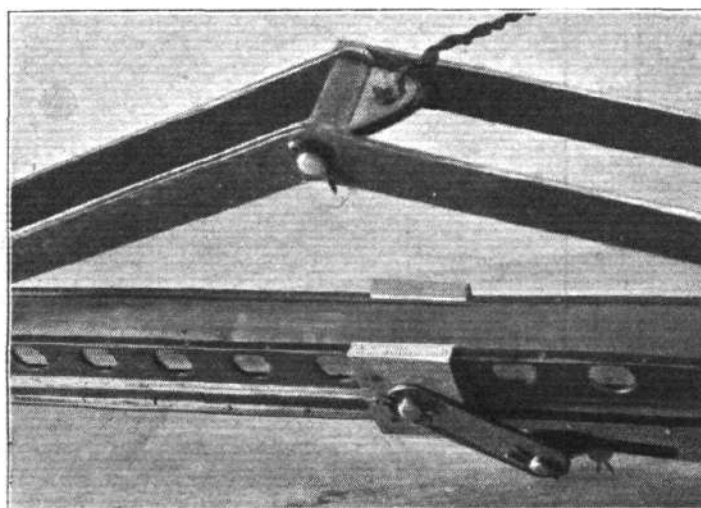
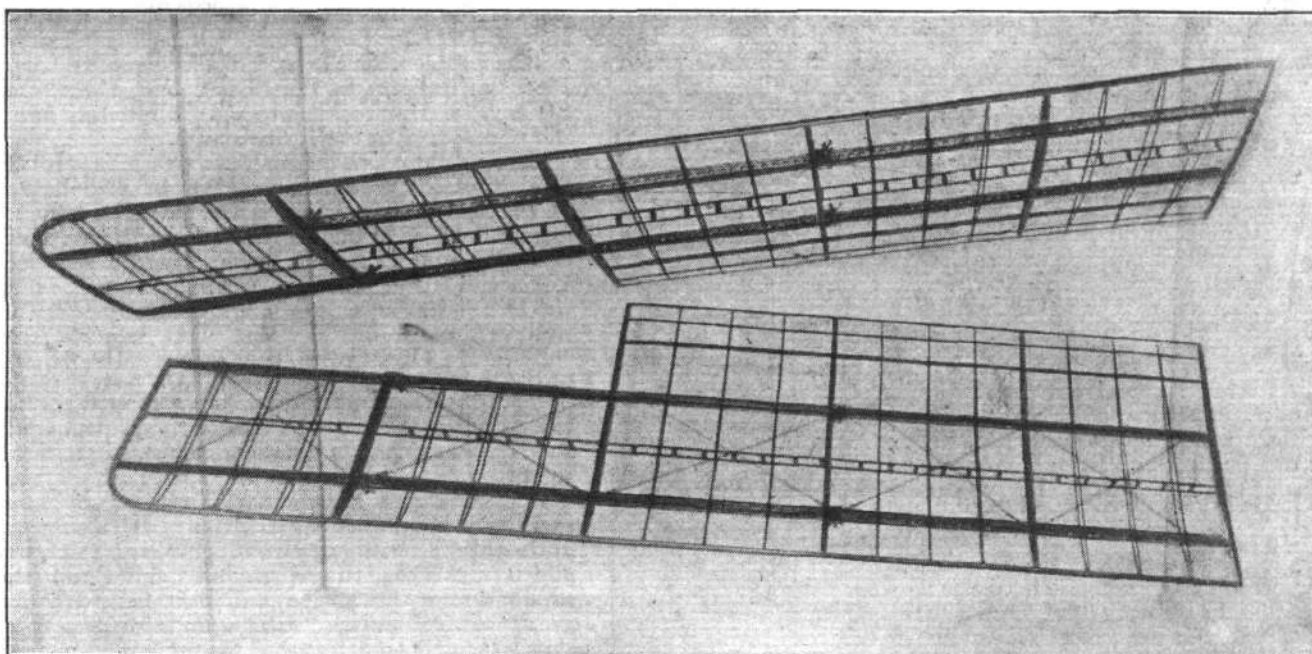


Fig. 16.

Fig.
17.

of Humber's, Ltd. An original design from which this firm's design was developed was very courteously placed at their disposal by Capt. Green, of Siddeley Deasy.

A drawback to all the designs heretofore described is the difficulty in applying them to existing machines without re-designing the fittings.

Messrs. Humber have produced a design which solves this difficulty, and they constructed a metal machine in record time.

lap joints, three of these lengths being identical, the fourth being tapered to suit the outer extremity of the wing. The webs and flanges were pressed to shape in a stamping machine.

The ultimate section decided on was similar to the above but of 35 ton steel with the flange and web of 26 gauge.

Fig. 19 shows a photo of the first plane built up on metal spars and tested at Farnborough, where it successfully withstood the required load.

Fig. 20 shows in detail the method of attaching the internal bracing and strut sockets and wiring plates to this wing. Standard Avro fittings are used throughout. The interplane strut fittings are raised from the spar by means of a very light steel box. The spar is stiffened to take internal bracing by means of a pressed steel cross transmitting the strain radially from the transverse bolt to the flanges and webs of the spar. The spar itself is stiffened to take torsional strain by means of aluminium distance pieces, the webs being connected by means of aluminium rivets passing through the distance pieces. The thrust of the interplane struts is taken on an aluminium pillar passing radially through the spar directly under the strut, the pillar being pierced by the transverse bolt which passes through pressed steel crosses. These crosses distribute the load over a large area of the spar.

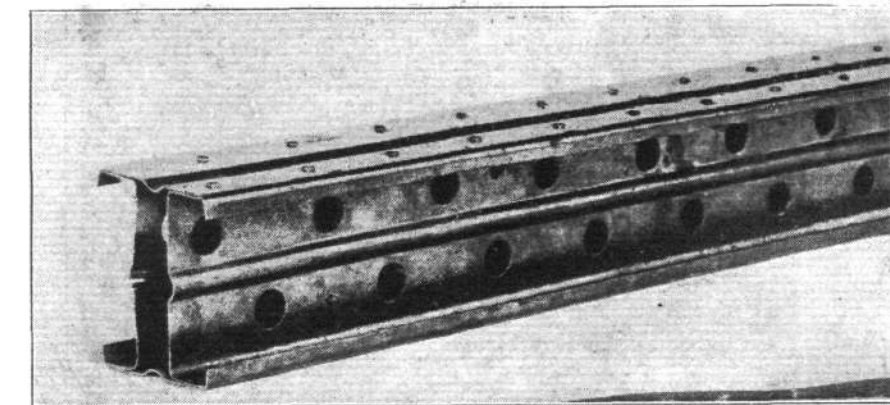
Figs. 21 and 22 show another method of attaching the fittings which is self-explanatory. The specimen has been tested to destruction and shows the failure of the flange in the centre.

Struts

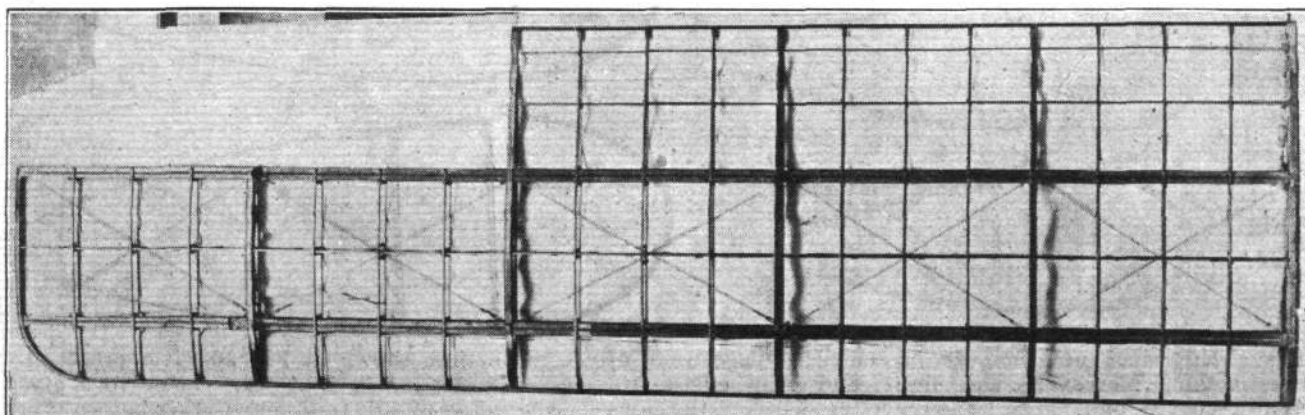
The solution of the strut problem is much simpler than that of the metal spar.

There are several principles which must be kept in mind in tackling the problem. Since the external shape must be such as to offer the minimum head resistance, we are limited

Fig. 18.



The first section (Fig. 18) was made of 25 gauge 31 ton steel sheet for both flange and web. The width of the flange was 2 ins. and a stiffening bead or longitudinal corrugation was rolled in the centre of the flange throughout its length. The web was lightened by circular holes punched on either side of a longitudinal bead or corrugation in the centre of the web and slightly smaller than the flange. This section is the same in all over-all dimensions as the standard Avro spar. The spar was made up of four lengths joined together by staggered

Fig.
19.

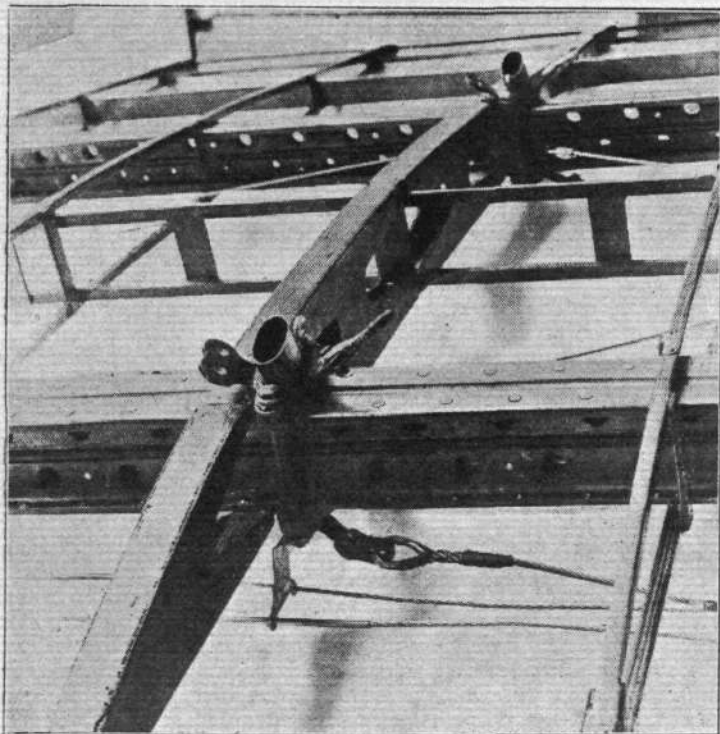


Fig. 20.

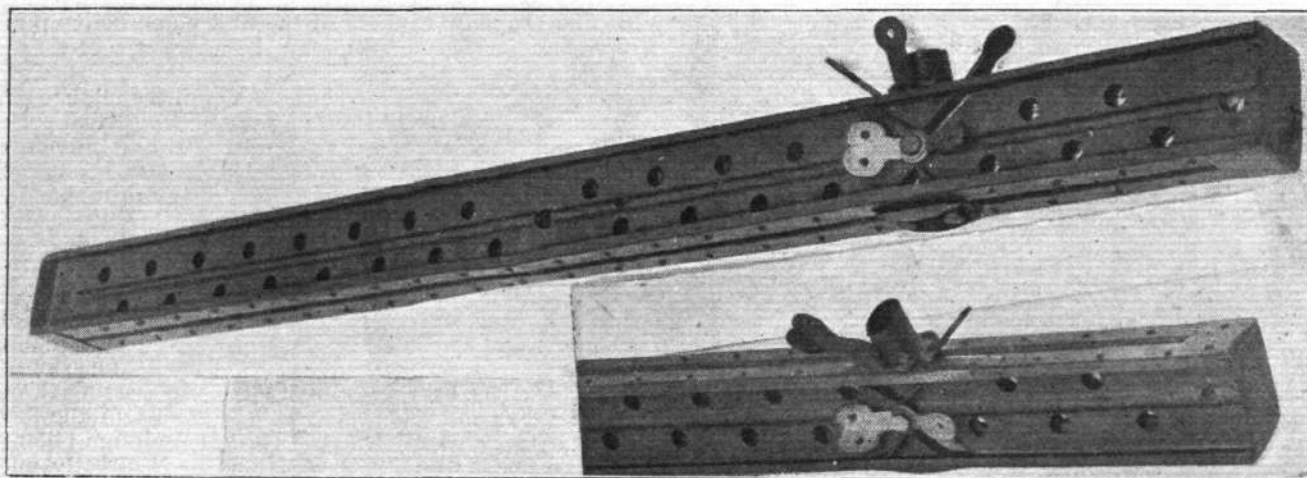
after is the provision of more metal at the sides and rigid supports for the sides.

This problem has been very successfully solved by C. A. Llewellyn Roberts, of the Birmingham Guild, and by Messrs. Sankey. Certain other designs are stronger and lighter than the best spruce or steel tube struts.

Fig. 23 shows the Birmingham Guild strut No. 4. This was designed to be constructed in two halves, the nose of the strut being designed to take the whole load. This nose was made in high tensile steel with a cross piece of the same material connected by electric spot welding.

The tail fairing was made of aluminium. The joint between the fairing and nose was made with a tinsmith's folded joint well hammered down. This strut weighed complete with end fittings 3 lbs. 1½ ozs., thus bringing the weight below that of the lightest Avro wood strut. On test, it supported a load of .75 ton on 66-in. centres, being 20 per cent. stronger than the Avro wood strut of nearest weight, although the wood in the latter case had a Young's modulus of 1.8×10^6 lbs. per sq. in.

Fig. 24 shows Birmingham Guild strut No. 5, which is extremely simple in construction. It is composed of three units only, a shell and two diaphragms, the extra one being added in this case to give greater rigidity and strength. The production of this strut required no hand labour. The units are all blanked out and formed up in presses, the units themselves being jigged together for spot welding, and the whole of the electric spot welding being done in three-quarters of an hour. The actual cost of this strut in production is stated to be half that of wood. Its weight is 3.15 lbs. as against 3.25 lbs. for the wood strut. Its failing load on 69-in. ball centres is .77 ton as against .475 ton for the wooden strut.



Figs. 21 and 22.

to a streamline shape. If a steel tube is used it must obviously be provided with fairing back and front, which does not contribute greatly to the strength, but adds considerably to the weight; moreover, steel tubes of high quality are expensive. It follows that steel tubes are not the best construction for this purpose except in non-exposed places, where streamlining and diameter are of no consequence.

If the exterior of the metal strut is to be streamline, the moment of inertia about the minor axis will be much greater than about the major

Struts for Large Machines

Figs. 25 and 26 give outline particulars of two types of streamline metal struts by the Birmingham Guild which are well suited for large machines. The double web type of

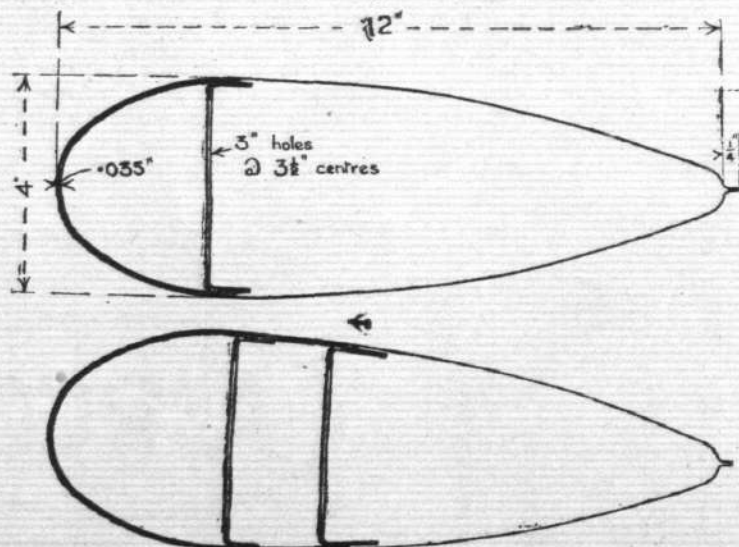
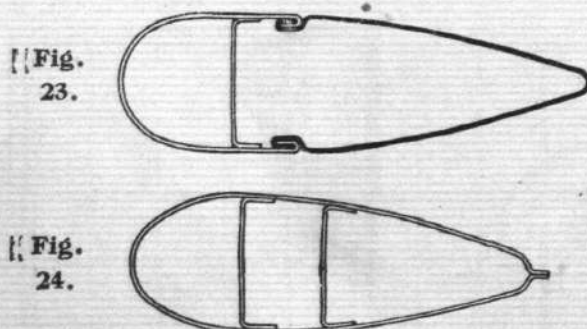


Fig. 25.

Fig. 26.

axis. This does not lead to an efficient disposition of the metal. Moreover, the front and rear edges are sharply curved, and hence self-supporting, whereas the sides are only slightly curved. The principle therefore to strive

construction, shown in Fig. 26, gives greater stiffness for a given width and weight when made to a given streamline section, say of 3 to 1, than any other known type made to the same streamline section. It is therefore stronger.

These types of struts are suitable for lengths up to 25 ft. or over, and there is no limit to the load they can be designed to carry.

Hollow wooden struts made of grade A spruce are known to be unsuitable for tropical use. Moreover, for a given width, weight, and length, hollow wooden struts have been found to be about 50 per cent. heavier than the double strut described above.

A round steel tube with wood and fabric fairing is about 70 per cent. heavier than these struts. Apart from this, solid drawn steel tubes of the sizes necessary for the largest machines are unobtainable.

Duralumin Machines. Vickers' Spars

All the previous descriptions have especially related to steel constructions, but many of the constructions are suitable for duralumin. The problem of the duralumin machine of various types has been tackled successfully by Commander Craven and Messrs. Pratt and Temple, of Vickers, Ltd., starting from a suggested design courteously placed at the firm's disposal by Professor Lea, of Birmingham University.

Methods of Design and Calculation of Girder Spars

In designing the most economical braced girder to withstand a certain definite system of loading, there are usually three points which have to be considered if the highest efficiency is to be obtained. These are: (a) The ratio of the overall depth of the girder compared with its pin-jointed length. If the girder is made very deep the weight of the bracing becomes excessive, while, on the other hand, if made too shallow, unnecessary weight has to be put into the main flanges or members. The maximum depth of the girder is usually limited by the section of the plane.

(b) The pitch of the bracing. If this is too great, unnecessary weight has to be put into the main flanges. If the pitch is too small the weight of the bracing is unnecessarily heavy.

(c) The properties of the actual section used for the main flanges or members. If the member is made very thin it fails at a low stress by secondary flexure, while, on the other hand, if the flanges are made very thick compared with their width, the radius of gyration for a given sectional area is necessarily small in proportion to the pin-jointed length, i.e., to the pitch of the bracing, and hence the member also fails at a low stress.

The effect of varying each of the above items has been very carefully investigated, and general data obtained which enable not only the strength of any particular girder to be accurately calculated, but also the girder to be so proportioned as to allow the maximum efficiency, from the point of view of strength for weight, to be obtained.

member in an absolutely rigid manner, the pin-jointed length of the elementary strut would be half the pitch of the bracing; on the other hand, if the bracing is without stiffness, or if only attached by a single rivet to the main member, then the pin-jointed length is taken as equal to the pitch of the bracing. The exact effect of the stiffness of the bracing on the pin-jointed length of the main member can be actually calculated in any case.

C.I.M. 720 has been brought up to date and amplified by a large number of experiments on flanges of various thicknesses.

Having fixed on the dimensions in (a), (b) and (c) above, the strength of the girder as a whole is next considered. The strength of the individual member, usually the flange between points of support of the bracing, is taken as the limiting stress at the centre of the girder, and then the failing load at the ends of the girder is calculated by the Alexander strut formula, which has been proved to give results in agreement with experiments.

The Alexander strut formula is as follows:—

$$\frac{p}{k^2} - \frac{l}{k} = A \frac{\delta}{k} \times \frac{\sqrt{p}}{f - p}$$

where

p is the intensity of stress in tons per sq. in. on the ends of the strut at failure.

l is the limiting fibre stress at the centre of the strut at failure. It is approximately equal to the limiting fibre stress under conditions of pure bending.

$\frac{p}{k^2}$ is equal to $\pi^2 E/p$. If Euler's curve for the material is plotted, i.e., $p = \pi^2 E/(l/k)^2$ then l/k is equal to the horizontal distance out to this curve at a height corresponding to the failing pressure p .

$\frac{\delta}{k}$ is the ratio of the distance of the extreme fibre from the neutral axis, to the minimum radius of gyration, measured in the direction of the latter.

A is a constant which equals $2c\sqrt{E}$, where c is the ratio of the equivalent eccentricity to the radius of gyration, usually taken as 1/10 for ordinary struts and 1/20 for especially straight struts. The value of $A = 2c\sqrt{E}$ is found by experiment for duralumin braced girders to be about 10.

The thinner the flanges of the angle, that is, the higher the value of s/t , where s equals the thickness of the flange, and t equals the width, the lower is the limiting stress at failure at the centre of the strut. This reduction in the limiting stress in the thinner members is of course due to the effects of failure by secondary flexure.

By plotting the failing loads of a series of experiments



Fig. 27.

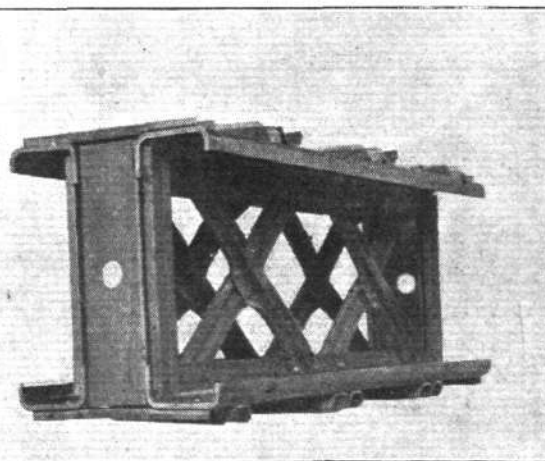


Fig. 28.



Fig. 29.

In addition to the above three points, there is an additional one (d) which has been investigated and has been found may be neglected. At first when the subject was approached it was thought that the strength of the small elements between points of attachment of adjacent bracing would depend on the stiffness of the bracing. Experiment has proved that the increase of strength to be obtained by this means unnecessarily increases the weight of the bracing and is not economical, and that the strength of the individual main member or flange may be calculated, by confidential information memorandum 720, as a strut with pivoted ends and of a length equal to that between the centres of the bracing attachment. If the bracing were infinitely stiff and were attached to the main

beams having varied thickness of angles against s/t for the angles a simple investigation shows the most efficient value of s/t to use with a fixed pitch of bracing.

With plain angles the limiting stress for sections for which $s/t = 30$ is only 7.8 tons per sq. in. On the other hand, for values of $s/t = 7$ the limiting stress is 17.5 tons per sq. in. The most economical values of s/t for plain angles appears to be between 6 and 8, and in any case should not exceed 10.

Large Spar

A series of girders for a large machine were built up to investigate the relations of s/t and limiting stress for plain angles (Fig. 27) and a similar series of girders were constructed with a

modified section for the main members. In general it was found that lipping improves the thin section, while, on the other hand, the failing stress in the case of the thicker sections is only a little higher. For instance, the limiting stress for sections for which $s/t = 30$ is 11.7 tons per sq. in. as against 7.8 for plain angles. Whereas for values of s/t of 7 the limiting stress of the lipped section is only 17.5, i.e., the same as the plain section. Hence there appears to be no advantage in lipping the sections.

In order to obtain the most economical design it is obvious that the dimensions of the main members will require to be varied from place to place. Therefore at the centre of a large machine, in view of the fact that duralumin cannot efficiently be solid drawn in sections thicker than 0.2 in., it may be found that the size of the angle members required become too great to permit them to be solid drawn. It therefore becomes necessary to modify the design. (One such modification is shown in Fig. 29. Plain angles are used to which are riveted longitudinally corrugated plates. To prevent local buckling of the plates the pitch of the rivets should not exceed 15 times the thickness of the plate.)

With regard to bracing it has been found that the best type of bracing is quite different from that used in airship girders.

In the case of airships, since the shear is small and the main members are of light section with a large pitch for the bracing, it follows that a rigid bracing in the plane of the members is economical. Moreover discontinuous bracing gives a further economy.

In the case of aeroplane girders the main members are much heavier and the value of L/K between bracing points so much smaller that the increase of strength to be gained by providing stiffening bracing is not justified. Moreover, since the shear is large, it follows that the bracing should be practically continuous to obviate the introduction of local bending moment; further, the Zeppelin type of bracing is inadmissible as this would necessitate double bracing.

The problem of the suitable attachment of the fittings presents as great difficulty in the case of large machines as in small ones. It is of such importance that the design should be modified in the first instance to enable this to be done economically.

In calculating the strength of a spar it is necessary to make allowance for the extra stresses induced by the bending moment introduced by deflection. For wooden spars it is usual to use Perry's formula for a strut subjected to a bending moment. The bending moment due to the lateral load is then multiplied by $P_e/P_e - P$ to obtain the equivalent bending moment. Where P_e = Euler's crippling load and P = end load in lbs. This makes allowance for the additional

stresses placed upon the spar due to the bending moment obtained by the product of end load times the deflection, and gives fairly satisfactory results for spindled wooden spars. It cannot be used, however, for calculating the strength of metal construction, experiment having proved that the deflection is of the order 10 times that given by Perry's formula.

The deflection of metal spars calculated in the following way has been found by Mr. Temple to agree with practice.

From the ordinary theory of beams the deflection in the centre of a girder under side loading is equal to

$$\delta = \frac{5}{48} \frac{L^2 M}{EI}$$

Where δ is the deflection in inches.

L is the length between the supports in inches.

M is the maximum bending moment in inches.

I is the moment of inertia in inch units about an axis perpendicular to the direction of loading

E is Young's modulus for the material of the girder which as a result of bending tests on girders is taken as 5,500 tons per sq. in.

Since
$$\frac{M}{I} = \frac{2f}{D}$$

where f is the limiting fibre stress and D is the total depth of a symmetrical section we have

$$\delta = \frac{5}{48} \times \frac{L^2}{5,500} \times \frac{2f}{D} = \frac{1}{26,400} \frac{fL^2}{D}$$

Now in the case of a long strut, if the direct stress is ignored, practically the same law should hold.

Since
$$M = Pe \times \delta \quad \therefore Pe = \frac{M}{\delta}$$

but

$$Pe = \frac{\pi^2 EI}{L^2}$$

$$\therefore \frac{M}{\delta} = \frac{\pi^2 EI}{L^2} \quad \therefore \delta = \frac{ML^2}{\pi^2 EI}$$

but

$$\frac{M}{I} = \frac{2f}{D} \quad \therefore \delta = \frac{2L^2 f}{\pi^2 ED} = \frac{2}{9.87 \times 5,500} \frac{L^2 f}{D}$$

$$\therefore \delta = \frac{1}{27,100} \frac{fL^2}{D}$$

The deflections calculated by the above means agree with the results of experiments. Therefore in designing beams to withstand combined stresses the approximate deflection should be calculated by the formula

$$\delta = \frac{1}{26,400} \frac{fL^2}{D}$$

(To be continued.)



An impression of the Breguet tractor biplane in flight.

Personals

Casualties.

Capt. BERNARD PAUL GASCOIGNE BEANLANDS, M.C., 1st Hants, attached R.A.F., who was killed while flying at Northolt on May 8, at the age of 21, was the son of the late Canon Beanlands, M.A., F.S.A., of Wickhurst Manor, Seven-oaks Weald, sometime Rector of Christ Church Cathedral, Victoria, B.C., and of the late Laura Maud Hills.

2nd Lieut. CLAUDE BRIDGETT, R.A.F., who was previously reported missing, and now believed killed at Gaudach, near Metz, on September 13, 1918, at the age of 18, was the youngest son of the late William Beddome Bridgett, and stepson of Mrs. Bridgett, of 12, Briar Walk, Putney, S.W.

Sec. Lieut. CECIL SEALEY DAVIS, R.A.F., who died at Craill, Fife, on May 7, at the age of 19, was the son of Mr. G. W. Davis, J.P., and Mrs. Davis, of Ilford, Essex.

Lieut. CUTHBERT HARRISON, R.A.F., of Hull, was killed in a flying accident on May 3, at the age of 26.

Maj. JAMES INGLEBY HARRISON, R.A.F. (Lieut.-Comdr., R.N.), previously reported missing, now officially assumed killed in action over Bruges on May 16, 1918, at the age of 36, was the fourth son of the late Rev. J. J. Harrison, Chaplain, R.N., and Mrs. Harrison, Boscastle, Cornwall.

Lieut. EDWARD SYDNEY JACOBI, R.A.F., who was killed in an aeroplane crash at Aldeburg on May 24, was the only son of Mr. and Mrs. Jacobi, of Blackheath.

Lieut. GEORGE NORTON, R.A.F., who died on May 10 at the age of 21, at the Empire Hospital, Vincent Square, as the result of a flying accident on October 30, 1918, was the second son of J. F. Norton, of Lisbon.

Maj. H. HUNTLEY ROBINSON, M.C. (bar), Medical Officer, 9th Wing, R.A.F., who was killed at Mons on May 3 in an aeroplane accident, was the second son of Dr. and Mrs. H. Shapter Robinson, of "Crantock," Epsom, formerly of Talfourd House, Camberwell. Born in May, 1889, he qualified M.R.C.S., L.R.C.P., in 1912 at the London Hospital, where he acted as house surgeon. He joined the R.A.M.C. as Medical Officer to the 21st London Regt. just before the declaration of war, and went to France early in 1915, where he served continuously with the 47th Division until last November, when he transferred to the R.A.F. He was three times mentioned in despatches, and was awarded the M.C. and bar. Major Huntley Robinson was highly esteemed and very popular. He was buried with military honours in Mons Cemetery on May 5.

Capt. WILLIAM CECIL ROWELL, 1st Batt. Loyal North Lancs. Regt., attached R.A.F., who died on May 22 at the age of 26, at the R.A.F. Auxiliary Hospital, 82, Eaton Square, W., was the only son of Mr. and Mrs. Spencer Rowell, of Kenwyn, Newton Abbot.

HUGH CASSILLIS SMITH, 78th Squadron, R.A.F., who was killed while flying near Hornchurch Aerodrome, on May 15, at the age of 19, was the second son of Mr. and Mrs. Macdonald Smith, 41, Onslow Gardens, Muswell Hill.

Married

Capt. WILLIAM BUCKINGHAM, M.C., R.A.F., eldest son of W. Buckingham, Esq., of Sydney, was married on May 21 at St. Mary Abbot's Church, Kensington, to JESSICA EDITH, youngest daughter of Mr. and Mrs. Frank MILTON, of Hill Place, Haslemere, Surrey.

HAROLD EDWARD, late Lieut., R.A.F., younger son of Charles Robert Nicoll FAULKNER, was married on May 14, 1919, at the Church of Our Lady, St. John's Wood, to ELISE MARIE JOSEPHINE, third daughter of Joseph Henri RÉGAT, of Brussels.

JOHN CHARLES BRADLEY FIRTH, late Maj., R.A.F., younger son of Mr. and Mrs. Bradley Firth, of Bishop's Sutton, Hants, was married on April 29 at Winchester Cathedral to RUTH ELEANOR, younger daughter of the Rev. J. H. HODGSON, of Dogmersfield Rectory, Hants.

Lieut. H. A. KAUPER, R.A.F., was married at Kingston Parish Church to Miss BEATRICE HOOPER, second daughter of Sub-divisional Inspector Hooper, of the V Division of the Metropolitan Police.

Lieut.-Col. R. P. MILLS, Royal Fusiliers and R.A.F., youngest son of W. H. Mills, of Eaton Grange, Parkstone, Dorset, was married on April 29 at Yatesbury Church, Wilts, to HELEN, elder daughter of W. H. BULPETT, of Old Alresford, Hants.

Sec. Lieut. JOHN W. RODMELL, R.A.F., only son of the late John Rodmell, of Hull, was married on May 10 at Belfort, France, to ISABELLE FRANÇOISE, daughter of M. Joseph TISCHMACHER, of Belfort, France.

Sec. Lieut. CYRIL TAYLOR, R.A.F., was married on May 7, at St. Barnabas Church, Clapham, to DOROTHY WINIFRED RATCLIFFE.

THEODORE JAMES WEST, M.C., R.A.F., was married on May 19 at Marylebone Parish Church to PEGGY, second daughter of the late WALTER RICE-EVANS, Esq., J.P., and Mrs. Rice-Evans, of Eagles Bush, Neath, Glamorganshire.

To be Married

The marriage arranged between Lieut.-Col. W. BOYS ADAMS, R.A.F., and Miss ENID CARNEGIE ARBUTHNOTT will take place on Wednesday, July 2, at St. Paul's, Knightsbridge.

A marriage has been arranged, and will shortly take place, between Maj. J. ST. AUBYN KING, Indian Army and R.A.F., and JEANNE, only daughter of Mr. and Mrs. W. E. DEMUTH, late of Nyasaland.

Items

Sec. Lieut. R. G. ABRAHAM, 99th Squadron, I.A.F., R.A.F., and Sec. Lieut. CHRISTOPHER HAROLD SHARP, Norfolk Regt., attached R.A.F., missing since September 26, 1918, and now presumed dead, were last seen over Metz Sablons, flying a D.H. 9C, 6274. Will anyone able to give any information regarding these officers kindly communicate with Mrs. Cecil R. G. Abrahams, School House, Gamlingay, Sandy, Beds.

Lieut. OSWALD GEORGE (OSSY) BRITTOROUS, R.A.F., late S.W. Borderers and Civil Service, who was reported missing after the engagement of his squadron (209) east of Villers-Bretonneux, on May 15, 1918, at the age of 19, is now presumed dead. Any information subsequent to the above date will be gratefully received by his parents at "Glenlyon," Rochdale Road, Blackley, Manchester.

Lieut.-Gen. SIR DAVID HENDERSON, K.C.V.O., K.C.B., D.S.O., has accepted the post of Director-General of the newly-formed League of Red Cross Societies.

12th Squadron, R.F.C.—The second reunion and dinner is being arranged for June 16, 1919, in London. All past and present officers who desire to attend, should communicate with Capt. Cresswell Turner, Wireless Experimental Establishment, R.A.F., Biggin Hill, Kent, enclosing £2 2s. to cover expenses.

The will of Lieut. the Hon. RICHARD GERALD AVA BINGHAM, R.A.F., of Bangor, killed in action, has been proved at £1,665.

The will of CYRIL DUDLEY HELY CORBETT, R.A.F., Medical Service, of Beaconsfield, Bucks, has been proved at £15,200.



The Dutch Aircraft Exhibition

THE organisers of the International Aircraft Exhibition which is to be held at Amsterdam in August next are hoping to make the British Section a thoroughly representative one. Several of the leading firms have promised to lend their aid, and it is proposed that the Section shall comprise the following groups: Historical, naval and military aircraft, commercial aeroplanes and seaplanes, motors, cars and cycles, construc-

tion, photography, maps, telegraphy and telephony, fittings and accessories, meteorology, surgery, clothing and equipment. Dr. W. R. Bisschop has undertaken the honorary supervision of the work connected with the British section, of which Mr. J. Vandersteen has been appointed Organising Manager. Temporary offices have been secured at Trafalgar Buildings, Trafalgar Square, W.C. 2. Only allied countries are to be invited to exhibit.

QUESTIONS IN PARLIAMENT

Reparation for Air Raid Damages.

Sir ARTHUR FELL, in the House of Commons on May 19, asked the Prime Minister if under the terms of the Peace Treaty with Germany compensation in full is to be paid for all actual damage done to property by aircraft; if, under these circumstances, the Government will reconsider the whole question of the Government anti-aircraft insurance scheme and the premiums paid thereunder, and the profit that has accrued to the Government; and if, when the German compensation is paid, the whole of the premiums paid, less expenses, will be available for return to those who paid them?

The Chancellor of the Exchequer (Mr. A. Chamberlain): As regards the first part of the question I would refer my hon. friend to Section VIII of the Official Summary of the Peace Treaty which was published on May 3. The reply to the last two parts of the question is in the negative.

Sir A. Fell: If damages are received from Germany in compensation for those aircraft raids will there be a distribution among the people who have suffered or will there be a return to them of premiums?

Mr. Chamberlain: No, Sir. If I may judge by my own feelings as a citizen who had the privilege of paying a premium for Government insurance, I was very well satisfied with the bargain that the Government made, and I see no reason why I should now have my premium back after having escaped damage or having received compensation.

Sir A. Fell asked if the owners of properties which were damaged by air raids will be able to recover from the German indemnity money the full cost of the reinstatement of their property after giving credit for such reduced sums as they may have received from aircraft insurance or the Government in part compensation for such damages?

Mr. Bonar Law: I do not think that my hon. friend's suggestion is practicable.

Cellulose Inquiry.

Sir FREDERICK BANBURY asked the Prime Minister when the Committee on the cellulose question will make its Report?

Mr. Bonar Law: I understand that the Report has been drafted and is under the consideration of the Committee.

Demobilisation Leave in the R.A.F.

Mr. GANGE asked the Secretary of State for War if men of the Royal Air Force who have been overseas for 18 months without leave are denied upon demobilisation the three weeks extra leave granted to all other ranks under Army Instruction No. 851 of 1918; and, if so, if he will explain the reason for this treatment?

Maj.-Genl. Seely: The leave referred to in Army Council Instruction No. 851 is not additional leave on demobilisation, beyond the 28 days demobilisation leave, but is leave granted to men retained to serve in the Force of Occupation who have completed their engagements. Similar conditions exist in the Royal Air Force.

Regents' Park Buildings.

Sir WILLIAM PEARCE asked the Under-Secretary of State to the Air Ministry if he will state what number of persons are now employed in the Air Force buildings, Regents' Park; what is the nature of the work; and when this portion of the park will be vacated by them.

Maj.-Genl. Seely: The number of persons at present employed by the Royal Air Force at Regents' Park is 2,332. They are engaged on the receipt, salvage, storage, and issue of aeroplane engines and their spares. Standard stocks are gradually being transferred to Ruislip, and it is hoped to complete this process by September 30. The buildings and stocks not required to be retained will be handed over to the Aircraft Disposal Department of the Ministry of Munitions, the period of whose retention of them will, I understand, depend upon the time required for the disposal of the stocks transferred.

Dogs Imported by Aeroplane.

Col. WESTON asked the Under-Secretary of State to the Air Ministry, in view of the spread of rabies in this country, the belief that dogs are being imported from dangerous countries by airmen, and the fact that outbreaks seem to have origin close to well-known aerodromes, if he will institute a Court of Inquiry to investigate the matter at Home and Continental aerodromes between which there is communication; will he furnish as far as possible to the proper authorities at Home the number of dogs so imported during the last twelve months, the names of the airmen who brought them over, and the names and addresses of the receivers of such dogs; and will he state what steps are taken by the military authorities at the ports of embarkation abroad and disembarkation at Home to ensure that dogs are not smuggled home, apart from the mere notification to troops and women who have been on service that it is forbidden?

Maj.-Genl. Seely: The Air Ministry has no information which bears out the suggestion that dogs have been imported by aeroplane. The matter is one which has received, and will continue to receive, close attention. Inquiries as to the procedure at ports of embarkation should be addressed to the War Office.

Anti-Aircraft Stations.

Capt. COOTE, on May 20, asked the Secretary of State for War whether he is aware that a number of officers and men eligible for release are being compulsorily retained in anti-aircraft stations in this country; what reason exists for the maintenance of such units; and when the personnel may expect their release?

Capt. Guest: Orders have been issued that all demobilisable personnel of the anti-aircraft companies in this country are to be demobilised with the least possible delay.

Air Ministry Motor Cars.

Lieut.-Col. W. GUINNESS asked the Secretary of State for War how many motor cars are being used by the Air Ministry?

Maj.-Genl. Seely: The number of cars used by the Air Ministry is 42. This includes cars used by branches of the Ministry housed in London but not in the Hotel Cecil.

Lieut.-Col. Guinness: Can the figure be given for those used by the Hotel Cecil?

Maj.-Genl. Seely: I think it is either six or eight at the outside—about that. Besides that there would be about 30. That will be 36 about, for the staff of the Air Ministry housed at the Hotel Cecil.

Alleged Defective Wing.

Mr. MADDOCKS asked the Under-Secretary of State to the Air Ministry whether his attention has been drawn to the report of the inquest on Flight-

Sergt. C. W. Wright, Royal Air Force, on Thursday, May 8, 1919, and to the verdict of the jury that his death was due to the collapse of his aeroplane owing to the use of wood unfit for use in aeroplane construction, and that the employment of such wood was due to the criminal negligence of some person or official at present screened by the Department, and whether he is prepared to disclose the names of the person or persons responsible for passing the aeroplane as fit for use?

Maj.-Genl. Seely: My attention has been drawn to the verdict given by the jury in the sad case referred to by my hon. friend, and I have given the most careful consideration to it. The expert advisers of the Air Ministry on accidents have made the fullest inquiry into the cause of the accident, but it has not been possible to decide with certainty on the cause of the breaking of the wing. They do not incline to the view that the cause of the accident was defective wood, but even assuming that that was the case one cannot be certain that inspection will disclose interior defects in a spar. The question of the right amount of dryness of wood is a highly technical one on which experts differ, our own standard of humidity being nearly double that specified in America. With regard to the last part of the question, I have placed all papers and information in our possession at the disposal of Sir Charles Mathews, Director of Prosecution, for his consideration.

Aircraft Works, Windsor.

Mr. TYSON WILSON asked the Under-Secretary of State to the Air Ministry whether it is intended to complete the aircraft works at Wendover, Bucks; and, if so, will he explain why the contractors are not supplied with the plans necessary for carrying on the work?

Maj.-Genl. Seely: The present intention is to complete these works, and the contractors have all the plans necessary to complete the work on which they are now engaged.

Surplus Aeroplanes.

Col. ASHLEY asked the Under-Secretary of State to the Air Ministry whether he will offer to the Overseas Dominions and Colonies some of the surplus aeroplanes now in the possession of the Air Ministry with a view to their being used for postal and similar services?

Mr. Pratt: My hon. and gallant friend has asked me to reply. The question of the form in which assistance can be rendered to British Possessions overseas for the purposes referred to by my hon. and gallant friend is under consideration, and I hope to be able to announce a decision very shortly.

Col. Ashley: Is the hon. gentleman aware that the Dominions would appreciate, not only the gift, but the spirit in which it was offered?

Mr. Pratt: Yes, Sir.

Emergency Rations for Mr. Hawker.

Capt. ELLIOT, on May 22, asked the Under-Secretary of State to the Air Ministry whether an official from the Air Ministry made up an emergency ration of 3,000 calories to last for 48 hours for Mr. Hawker; whether he is aware that this is inadequate even for one day; and whether he will ensure that more accurate information is supplied to any others consulting his Ministry?

Mr. Pratt: No official at the Air Ministry made up any emergency ration for Mr. Hawker, but detailed suggestions were made as to the amount of suitable food necessary for the flight. The suggested rations per man were equivalent to a heat value of 12,557 calories. The second and third parts of the question therefore do not arise.

Orders for Flying Boats.

Mr. MACQUISTEN asked the Under-Secretary of State to the Air Ministry whether, at the outbreak of war, the Admiralty purchased a flying boat of new and successful design by Mr. Norman Thompson, built by Messrs. White and Thompson (subsequently renamed the Norman Thompson Flight Co. in 1915), a pioneer firm established in 1909; whether this design, developed in structural details and ultimately known as Type N.T. B., was ordered in repetition from other firms as well as the Norman Thompson Flight Co., and in April, 1918, was unanimously adopted by the Air Ministry as their standard naval instruction machine; whether, in 1915, the Admiralty placed an order with the Norman Thompson Flight Co. for ten flying boats of such size that the firm were compelled to lay out considerable money in additional buildings to their existing works; whether, for twelve months after these extensions were completed in May, 1916, the Government were aware that the firm were only able to work at about one-third full output owing to constant changes in design ordered by the Admiralty and shortage of orders, and whether in the autumn of 1916 the Admiralty refused to allow the War Office to place orders with the firm; whether, in June, 1917, the Air Board required the firm to again increase their works for the production of one of their designs of flying boats (Type N.T. 4A), and subsequently agreed to advance £20,000 for new buildings; whether, after placing considerable orders in the autumn of 1917 for N.T. 4A. flying boats, the Air Board cancelled those orders in January, 1918, and gave no new orders until May, 1918, after the appointment of a receiver for the debenture holders; whether an urgent letter from Mr. Norman Thompson, dated July 20, 1918, addressed to the Air Minister, asking him to redress the situation created by the above actions of the Admiralty, War Office, and Air Ministry, though formally acknowledged, has never been answered; and whether the Aircraft Finance Department of the Ministry of Munitions in October, 1918, refused the recommendation of the Lubbock Committee of the Treasury to pay off the debentures issued to Messrs. Cox and Co. as security for advances and re-vest the control of the company in the directors?

Mr. Pratt: The answer to the third part of the question is that boats of the type referred to were used, not exclusively, but in conjunction with other types for seaplane instruction. I am making inquiries in regard to the letter mentioned in the penultimate portion of the hon. member's question, and will communicate with him. Of the remaining parts of the question, the first, second, fourth, fifth, and sixth would appear to be for the Admiralty; the seventh, eighth, and tenth for the Ministry of Munitions.

Honorary Commissions for Demobilised Flight Cadets.

Mr. F. C. THOMSON asked the Under-Secretary of State to the Air Ministry why flight cadets who were demobilised between the date of the Armistice and February 15, and were given no option in the matter, should not be granted honorary commissions, while those who have been demobilised since February 15 have been granted honorary commissions?

Mr. Pratt: Honorary commissions will be granted to cadets who were demobilised before February 15.

A Record Paris-Morocco Trip

LEAVING Villacoublay near Paris at 3 a.m. on May 24, Lieut. Roget, with Capt. Coli, on a new 30 h.p. Breguet, made a non-stop flight of 1,375 miles to El Knitra, about 20 miles from Rabat, where they arrived at 6 p.m. The course taken was approximately Bordeaux-Madrid-Toledo-

Cordova-Gibraltar-Tangier. They had to cross the Pyrenees Guadarrama and the Sierra Nevada. On landing the machine was damaged owing to the unevenness of the ground, and the aviators were forced to abandon their idea of flying to Dakar (West Africa) and thence to Brazil.

M. Breguet has stated that he is building several machines capable of making non-stop flights of 2,200 miles.

THE ROYAL AIR FORCE

London Gazette, May 16

Technical Branch

Maj. H. J. Newton-Clare, O.B.E., to be Maj., Grade (B) from (S.O.); May 1. Lieut. J. A. Atkinson to be actg. Capt. while employed as Capt., Grade (A); June 1, 1918 (substituted for notification concerning this officer, which appeared in *Gazette* Feb. 11). Sec. Lieuts. (actg. Capts.) to be Lieuts., without pay and allowances of that rank, and to retain their actg. rank until April 30:—J. M. McEntegart; Jan. 19. J. R. Coulthard; April 23. Sec. Lieut. J. Tunbridge to be Sec. Lieut., Grade (B) from (Ad.); Jan. 4. Sec. Lieut. W. E. Hunt (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut., Grade (B); April 20.

(Then follow the names of 30 officers who are transfd. to the Unemployed List under various dates.)

Maj. L. Y. K. Murray resigns his commn. and is permitted to retain his rank; May 17.

The following relinquish their commns. on account of ill-health contracted on active service:—Lieut. L. N. Page; May 6, and is permitted to retain his rank. Lieut. A. Dobner; May 7. Sec. Lieut. E. I. Davies; April 29, and is permitted to retain his rank. Notification of Feb. 25 concerning Maj. H. F. Fisher is cancelled.

Medical Branch

The following relinquish their commns. on ceasing to be employed:—Hon. Lieut.-Col. G. Dreyer; March 31, and is permitted to retain the rank of Lieut.-Col. Maj. (actg. Lieut.-Col.) R. H. McGiffen (Staff Surgeon, R.N.); Jan. 13. The following are transfd. to the Unemployed List:—Maj. P. H. Hadfield; April 1. Capt. J. J. O'Mullane; April 24. Maj. A. Paling relinquishes his commn. on account of ill-health, and is permitted to retain his rank; May 5. Notification of May 13 concerning Capt. C. F. Graves is cancelled.

Chaplains' Branch

Capt. H. F. Horton is transfd. to the Unemployed List; April 19.

Memoranda

Capt. A. F. Morris (Welsh R) is granted the hon. rank of Maj.; May 16. The following relinquish their commns. on ceasing to be employed:—Temp. Hon. Lieut. H. C. Smith; March 16. Temp. Hon. Capt. M. Windsor; May 16.

(Then follow the names of seven officers who are transfd. to the Unemployed List under various dates.)

London Gazette, May 20

The following temporary appointments are made:—

Chief of Air Staff.—Maj.-Genl. Sir H. M. Trenchard, K.C.B., D.S.O., vice Maj.-Genl. Sir F. H. Sykes, K.C.B., C.M.G.; March 31.

Director of Training and Organisation.—Col. (actg. Maj.-Genl.) P. W. Game, C.B., D.S.O., to relinquish the actg. rank of Maj.-Genl., and to be actg. Brig.-Genl. whilst so employed.

Director of Equipment.—Col. (actg. Maj.-Genl.) C. L. Lambe, C.M.G., D.S.O., to relinquish the acting rank of Maj.-Genl., and to be actg. Brig.-Genl. whilst so employed.

Deputy Director of Personnel.—Col. H. P. Smyth-Osbourne; May 1.

The following temporary appointments are made:—

Brigadier-General (Staff).—Lieut.-Col. (actg. Brig.-Genl.) C. L. N. Newall, C.M.G., A.M.; March 17, and to retain the actg. rank of Brig.-Genl. until April 30.

Colonel (Staff).—Lieut.-Col. J. G. Hearson, C.B., D.S.O., and to be actg. Col. whilst so employed; May 22.

Staff Officer, 2nd Class.—(P.)—Capt. L. M. Boddam-Whetham; May 1, vice Capt. (actg. Maj.) C. B. Baker.

Staff Officers, 3rd Class.—(Q.)—Lieut. H. C. Calvert; Feb. 2. (T.)—Sec. Lieut. (Hon. Lieut.) G. A. Tilly; Feb. 9, and to be actg. Capt. until April 30, vice Sec. Lieut. (actg. Capt.) A. B. Sharples (substituted for notification in *Gazette*, April 4).

Flying Branch

Sec. Lieuts. to be Lieuts.:—A. W. Davison; May 27, 1918. A. Bentley; Dec. 26, 1918.

The following relinquish their commns. on ceasing to be employed:—Lieut. G. A. H. Trudeau (Lieut., N. Scotia R.); Dec. 12, 1918. Sec. Lieut. (Hon. Lieut.) S. P. Willis (Lieut., R.A.S.C.); Feb. 3. Lieut. H. L. Symons (Capt., Can. Engrs.); Feb. 10. Capt. G. L. Lumsden (Lieut., Cent. Ont. R.); Feb. 16. Lieut. A. D. Walker (Lieut., S. Lanc. R.); Feb. 20. Lieut. B. Donald, D.F.C. (Lieut., Lond. R.); Feb. 21. Sec. Lieut. (Hon. Lieut.) A. McBride (Lieut., W. Ont. R.); Feb. 25. Sec. Lieut. (Hon. Capt.) J. E. Purslow, M.C. (Capt., Sask. R.); Feb. 27. Sec. Lieut. (Hon. Lieut.) J. C. F. Holland (Lieut., R.E.); March 14. Lieut. (Hon. Capt.) E. C. Clancey (Capt., Ont. R.); March 16. Lieut. A. E. Roodhouse (Lieut., Can. Engrs.); March 19. Lieut. E. A. Coapman (Lieut., C. Ont. R.); March 27. Lieut. (Hon. Capt.) H. C. E. Cherry (Glouc. R.); Lieut. (actg. Capt.) W. J. A. Duncan, M.C. (Lieut., Can. Rly. Serv.); Lieut. M. W. Waddington (Lieut., Can. F. Art.); March 31. Lieut. (actg. Capt.) J. M. McKay (Lieut., Quebec R.); April 4. Sec. Lieut. (Hon. Lieut.) I. W. F. Agabeg (Lieut., S. Lanc. R.); April 9. Sec. Lieut. (Hon. Lieut.) W. G. Waight (Lieut., North'd Fus.); April 10. Lieut. (Hon. Capt.) A. E. Pickering (Capt., W. Ont. R.); April 30. Lieut. A. G. McCorquodale (Arg. and Suth. Highrs.); May 2.

(Then follow the names of 200 officers who are transfd. to the Unemployed List under various dates. We regret that owing to pressure on our space it is impossible to reprint this portion of the List.—Ed.)

Maj. F. G. Small (Capt., Conn. Rgrs.) resigns his commn. and is permitted to retain the rank of Maj.; May 21.

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—A. G. Bullock (contracted on active service); April 30. D. W. T. Cain (caused by wounds), W. R. May, D.F.C. (contracted on active service); May 8.

Lieut. J. N. Kavanagh resigns his commn.; May 21.

Sec. Lieut. (Hon. Lieut.) J. W. Pryor relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain the rank of Lieut.; May 8.

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—H. J. Boyle; March 6 (substituted for notification in *Gazette* Jan 10). A. K. Barter (contracted on active service), D. Rose; May 8. A. R. Coppin; May 9.

Sec. Lieut. J. B. P. Phillips is antedated in his appointment as Sec. Lieut. (A.); Aug. 22, 1918.

The surname of H. Frew is as now described, and not H. Frow as stated in *Gazette* Dec. 6, 1918.

The notification in *Gazette* June 14, 1918, concerning Sec. Lieut. T. Buchanan is cancelled.

The rank of Lieut. J. A. Massey is as now described, and not Sec. Lieut. as stated in the *Gazette* April 25.

The notification in *Gazette* March 28 concerning Lieut. O. Darlington is cancelled.

The notification in *Gazette* May 9 concerning Lieut. V. R. Blow is cancelled.

The notification in *Gazette* April 15 concerning Lieut. J. Burness is cancelled.

Administrative Branch

Lieut. F. E. Lefevre, M.C., to be Lieut., from (O.); May 5. Sec. Lieut. N. Bucknall to be actg. Capt. without pay and allowances of that rank while specially employed; April 12.

Sec. Lieut. C. T. H. Page to be Lieut.; April 30.

Sec. Lieut. (Hon. Lieut.) J. F. Lewis to be Sec. Lieut. from (S.O.), and to be Hon. Lieut.; May 1.

The following relinquish their commns. on ceasing to be employed:—Sec. Lieut. J. W. Squire (E. Surr. R.); Feb. 9. Lieut. A. P. Cragg (Loyal N. Lancs. R.); Feb. 14. Sec. Lieut. W. R. Hutchins (R.F.A.); Feb. 24. Lieut. N. Hoole (W. Yorks R.); March 21. Maj. H. L. Nixon (K.O. Lancs. R.); March 26. Lieut. F. W. D'Alton, M.C. (R.G.A.); April 10. Capt. F. A. Coward (R.W. Surr. R.); April 22.

(Then follow the names of 24 officers who are transfd. to the Unemployed List under various dates.)

Sec. Lieut. (Hon. Capt.) N. McL. Kennedy relinquishes his commn. on account of ill-health, and is permitted to retain the rank of Capt.; May 8.

The initials of Sec. Lieut. T. A. Crowe are as now described and not F. A., as stated in *Gazette*, May 2.

Technical Branch

Maj. A. Levick to be graded for purposes of pay and allowances as Lieut.-Col., Grade (B) from (S.O.); May 1.

F. A. C. Hole is granted a temp. commn. as Maj.; April 1, 1918.

C. H. R. E. Raven (Lieut., R.E., T.F.) is granted a temp. commn. as Capt., Grade (A); April 1, 1918 (substituted for notification concerning this officer in *Gazette* of March 4).

Lieut. (Hon. Capt.) F. Grave to be actg. Capt. whilst employed as Capt. Grade (B), from May 22, 1918, to April 30.

Lieut. (Hon. Capt.) F. Grave to be graded for purposes of pay and allowances as Capt., Grade (B) May 1.

Lieut. W. A. B. Probert to be Lieut., Grade (B) from (Ad.); Nov. 7, 1918.

Sec. Lieuts. to be Lieuts., with pay and allowances of that rank:—(Hon. Lieut.) H. B. Lee; April 2, 1918. C. H. Boreham; Jan. 27. M. C. S. Bowley; May 5.

Sec. Lieut. A. H. Hollingdale to be Sec. Lieut., Grade (A) from (Ad.); Feb. 18. Sec. Lieut. W. Wilcock to be Sec. Lieut., Grade (A) from Grade (B); May 13. Sec. Lieut. (Hon. Lieut.) (actg. Lieut.) F. H. Astle to be Sec. Lieut., Grade (B), and relinquishes the actg. rank of Lieut. on ceasing to be employed as Lieut. (and to be Hon. Lieut.); April 24.

Sec. Lieut. T. H. Spence (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut., Grade (B); Sept. 4, 1918.

Sec. Lieut. (Hon. Lieut.) E. H. Morriss (R.A.S.C.) relinquishes his commn. on ceasing to be employed; April 26.

(Then follow the names of 41 officers who are transfd. to the Unemployed List under various dates.)

The notification in the *Gazette* of Nov. 22, 1918, concerning Sec. Lieut. (Hon. Capt.) F. Grave is cancelled.

Medical Branch

Transferred to the Unemployed List.—Capt. C. Dickson, M.C.; April 24. Lieut. J. Wynne Yorke-Davis; April 26.

Dental Branch

Lieut. R. C. T. Evetts is transfd. to the Unemployed List; April 3.

Chaplains' Branch

Capt. the Rev. J. H. Newell is transfd. to the Unemployed List; May 10.

Memoranda

The following are granted the actg. rank stated against their names, with effect from May 1:—

To be Acting Brigadier-Generals.—Col. F. R. Scarlett, C.B., D.S.O., whilst commanding No. 12 Group; Lieut.-Col. F. G. Willock, D.S.O., whilst in command of Blandford and Halton; Col. E. A. D. Masterman, C.B.E., A.F.C., whilst specially employed.

To be Acting Colonels.—Lieut.-Col. A. W. Bigsworth, C.M.G., D.S.O., whilst commanding No. 10 Group; Lieut.-Col. T. D. C. Barry, C.B.E., whilst President of Invaliding Med. Boards.

To be Acting Lieut.-Colonels.—Maj. B. R. Bickford, D.S.O., whilst Commandant of Medical Officers' Pool; Maj. A. V. J. Richardson, whilst Senior Medical Officer and Officer Commanding Blandford Hospital; Maj. J. L. Birley, whilst Inspecting Officer; Maj. H. C. T. Langdon, O.B.E., whilst Principal Medical Officer, S-East Area; Maj. F. F. Muecke, C.B.E., whilst Officer Commanding R.A.F. Cent. Hosp. (Officers); Maj. H. F. Horne, whilst Chief Sanitary Officer; Capt. J. McIntyre, M.C., whilst employed as Staff Officer, 1st Class, with Dir. of Med. Services.

Relative Rank of Lieut.-Colonel.—Rev. R. Hall, whilst employed as Principal Chaplain; Rev. W. Moffatt, whilst employed as Principal Chaplain.

To be Acting Hon. Lieutenant-Colonels.—Hon. Maj. M. W. Flack, C.B.E.

To be Acting Majors.—Lieut. W. W. Gibson, O.B.E., while specially employed; Capt. M. H. Smith, while specially employed; Capt. C. J. G. Taylor, Capt. W. Darling, M.C., Capt. J. M. Kirkness, Capt. B. A. Playne, D.S.O., Capt. R. H. Knowles, Capt. A. A. Atkinson, Capt. H. A. Hewat, Capt. C. E. Thwaites, Capt. H. B. Porteous, Capt. H. M. S. Turner, Capt. H. A. Treadgold, Capt. H. E. Whittingham, Capt. J. J. C. Hamilton, Capt. A. P. Bowdler, Capt. T. S. Rippon, Capt. J. H. Porter, M.C., Capt. P. L. Moore, Capt. F. C. Jobson, Capt. D. Ranken, Capt. L. C. M. Wedderburn, Capt. J. MacGregor, M.C., Capt. M. R. Dobson, Capt. F. N. B. Smart, Capt. W. C. Murray.

Relative Rank of Major.—The Rev. B. W. Keymer, O.B.E., while employed as Deputy Chaplain-in-Chief.

To be Acting Captains.—Lieut. L. C. Broughton-Head, while specially employed; Lieut. C. H. Vernon, while specially employed; Lieut. G. W. Harbottle, while specially employed; Lieut. G. W. Allen, while specially employed; Lieut. J. P. P. L. Biggs, while employed at a Base Pay Office; Lieut. C. H. Young, while employed at a Base Pay Office; Lieut. H. G. Jones, while employed at a Base Pay Office.

The notification which appeared in *Gazette* May 9 regarding the following is hereby cancelled:—Rev. R. E. V. Hanson, M.A., Rev. S. L. Clarke, M.A. B.Sc., Rev. S. J. Jones, M.C., Rev. J. Dey, D.S.O., Rev. R. Hall, Rev. W. Moffatt.

Lieut. G. K. Johnson to be actg. Capt. while holding a special appointment at Ministry of Munitions; Oct. 28, 1918 (substituted for notification in *Gazette* April 3).

Maj. (actg. Lieut.-Col.) H. R. Bentley (Lieut., Spec. List) relinquishes his commn. on ceasing to be employed; May 8.

(Then follow the names of three officers who are transfd. to the Unemployed List under various dates.)

London Gazette, May 23.

The following temporary appointments are made:—
Staff Officer, 1st Class.—(Air).—Maj. (actg. Lieut.-Col.) A. H. C. Kearsey; Dec. 28, 1918, and to retain the actg. rank of Lieut.-Col. to April 30.
Staff Officers, 3rd Class.—(P.).—Lieut. (actg. Maj.) Hon. M. H. R. Knatchbull-Hugessen, M.C., relinquishes the appointment of Staff Officer, 2nd Class (Air), and the actg. rank of Maj.; April 14, and to be actg. Capt., from April 14 to April 30. Lieut. (actg. Capt.) A. T. Wynward-Wright; Jan. 25, and to retain the actg. rank of Capt. to April 30, vice Capt. M. W. Bovill; Lieut. (actg. Capt.) W. S. Hill-Reid; Dec. 28, 1918, and retains the actg. rank of Capt. to April 30. (Q.).—Lieut. A. H. Burman; April 4, vice Lieut. (actg. Capt.) H. Sorrell. (T.).—Sec. Lieut. (Hon. Lieut.) (actg. Capt.) W. E. Cowie; Jan. 14, and retains the actg. rank of Capt. to April 30.

Flying Branch.

Capt. F. G. S. Williams to be Capt. (A.), from (Ad.); March 14.
Second Lieutenants to be Lieutenants.—(Hon. Lieut.) R. J. McNab; April 6, 1918. (Hon. Lieut.) F. H. Allchurch, H. R. Hill, M.C.; April 30, 1918. R. W. Drevett; May 9, 1918. (Hon. Lieut.) M. McEwan, D.F.C.; May 11, 1918. (Hon. Lieut.) C. P. Harrison, M.C.; May 18, 1918. J. S. A. Willis, E. L. Ridley; May 29, 1918. (Hon. Lieut.) C. A. S. Booth; May 30, 1918. (Hon. Lieut.) G. L. Childs; June 14, 1918. (Hon. Lieut.) C. M. McGorrey; June 18, 1918. (Hon. Lieut.) J. R. Houghton; July 11, 1918. (Hon. Lieut.) T. R. Evans; Aug. 2, 1918. A. Murray; Aug. 10, 1918. J. Carrey; Aug. 16, 1918. H. F. Lea; Aug. 18, 1918. (Hon. Lieut.) H. J. Knudson; Aug. 23, 1918. A. P. Godfrey; Aug. 27, 1918. P. A. Cooper; Sept. 1, 1918. J. M. Craig, V.C.; Sept. 6, 1918. (Hon. Lieut.) D. Storres-Fox; Sept. 10, 1918. H. M. Crighton; Sept. 27, 1918. H. E. Elsworth; Sept. 28, 1918. R. P. A. Crisp, (Hon. Lieut.) L. W. R. Grubb; Oct. 1, 1918. (Hon. Capt.) H. W. Deacon; Oct. 6, 1918. (Hon. Lieut.) D. Hodson; Oct. 9, 1918. G. Campbell; Oct. 15, 1918. H. Mercer, M.C., (Hon. Capt.) N. Greenslade, M.C.; Oct. 19, 1918. J. A. Degaye, G. E. Moore, M.C., C. L. Pargeter, D.F.C.; Oct. 26, 1918. S. T. R. Lloyd (Hon. Lieut.), R. Tully; Oct. 27, 1918. J. Cave, J. C. Crook, (Hon. Lieut.) G. N. Snowball; Oct. 28, 1918. E. F. Briggs; Oct. 31, 1918. M. B. Joseph; Nov. 8, 1918. S. A. Packman; Nov. 26, 1918. R. Kelly; Nov. 30, 1918. A. J. Hannah; Dec. 1, 1918. A. J. Bird; Dec. 9, 1918. E. J. Caprara; Dec. 27, 1918. (Hon. Capt.) H. B. Wilson, D.F.C.; Dec. 29, 1918. A. E. Gardiner (Hon. Lieut.) P. G. Allday, A. V. Crebbin, (Hon. Lieut.) R. W. Griffiths; Jan. 1. A. E. Heath; Jan. 5. V. Limerick; Jan. 15. A. W. Rogers, M.M., W. I. L. Legg, C. Malthouse, P. W. Watson, A. F. Moyles; Feb. 1. C. Longland, W. E. Hedley; Feb. 2. T. J. J. Griffiths; Feb. 16. (Hon. Lieut.) A. A. English, M.C.; Feb. 18. J. T. Rose; Feb. 22. H. Vanstone; Feb. 25. O. E. Miller; Feb. 28. A. D. Neish; Feb. 28. A. Hirschberg; March 1. D. S. St. A. McCulloch; March 5. J. H. Cogan; March 9. J. B. P. Phillips, W. T. Ward, W. A. Pegges, A. G. Batterham; March 12. W. L. Goddard, B. A. Greenfield, W. P. Mills, L. H. Weedon, H. J. E. Whitfield; March 26. (Hon. Capt.) H. W. Beck; March 29. B. H. Stretton, J. H. W. Haswell, G. T. Polkinghorne, C. M. Whitham; April 11. E. S. Noble, H. G. Pope, J. Spencer, A. A. Sykes; April 12. S. R. Austin, W. J. Barber, G. C. Hyde; April 13. A. J. Fyfe; April 14. F. Ollenbittle, L. C. Pitts; April 21. M. E. Bradley, H. E. Cardwell, W. S. Campbell, E. Teller, J. S. Pickles, D. U. Thomas, G. E. T. Payne; April 25. J. L. Lund, M.C.; April 28. C. Rigby; May 1.

The following relinquish their commns. on ceasing to be employed:—Lieut. J. F. Verner (Lieut., B. Col. R.); Nov. 19, 1918. Capt. A. E. McKeever, D.S.O., M.C.; Jan. 21. Lieut. A. D. Ferguson (Capt., High. L.I.); Feb. 12. Lieut. I. O. Chantler (Lieut., Sask. R.); Feb. 24. Sec. Lieut. (Hon. Lieut.) J. Miller (Lieut., Arg. and Suth'd. Highrs.); Feb. 26. Lieut. D. A. Macdonald (Lieut., Can. For. C.); March 10. Lieut. F. H. Taylor, M.C. (Lieut., C. Ont. R.); March 18. Lieut. H. Carnegie (Lieut., W. Ont. R.); March 31. Lieut. R. H. Johnson; April 1. Lieut. G. H. Gibbs (Sec. Lieut., R.G.A.); April 7. Lieut. F. E. Gilpin (Lieut., R.G.A.); April 11. Lieut. L. E. Porter (Capt., Canadians); April 14. Capt. S. E. Neal; April 18. Lieut. S. H. Kerr (Lieut., E. Ont. R.); April 26. Lieut. O. Berry (Lieut., Can. Gen. List); April 28. Lieut. (Hon. Capt.) K. Rawson-Shaw (Capt., R.A.); May 7.

Capt. (actg. Maj.) T. Gran, M.C., is temporarily transfd. to Unemployed List; April 26.

(Then follow the names of 200 officers who are transfd. to the Unemployed List under various dates. We regret that owing to pressure on our space, it is impossible to reprint this portion of the List.)

The following Captains relinquish their commns. on account of ill-health contracted on active service, and are permitted to retain their rank:—R. Redfern, D.F.C.; May 12. D. H. Chamberlain; May 19 (substituted for notification in *Gazette* Oct. 11, 1918).

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—A. R. Metelerkamp (caused by wounds); May 8. E. L. Fosse (contracted on active service); May 10.

The following Lieuts. relinquish their commns. on account of ill-health contracted on active service:—J. M. P. Adam (K.O.S.B., T.F.); May 7. C. R. Gaffney (L'pool R., T.F.); May 8.

Lieut. F. W. Kantel (Can. F. Art.) resigns his commn.; May 24.

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—R. J. Acheson, G. F. Holford, A. G. Middleton, J. E. Parke (caused by wounds); May 8. H. J. Andrews, A. J. Bishop (caused by wounds); May 13. F. B. Miseroy; May 14.

Sec. Lieut. R. J. Loughlen is dismissed the Service for absence without leave; April 12.

The surname of Capt. (actg. Maj.) R. H. B. Ker is as now described, and not Kerr, as stated in *Gazette* Feb. 21.

The surname of Sec. Lieut. F. Wight is as now described, and not Wright as stated in *Gazette* April 1.

The notification in *Gazette* April 1 concerning Sec. Lieut. (Hon. Lieut.) E. M. Bates is cancelled.

The notification in *Gazette* Feb. 25 concerning Lieut. D. A. McDonald is cancelled.

The notification in *Gazette* Feb. 21 concerning Lieut. H. S. Hill is cancelled.

The notification in *Gazette* Dec. 20, 1918, concerning Sec. Lieut. A. R. Lee is cancelled.

The notification in *Gazette* May 2 concerning Lieut. (actg. Maj.) D. L. Blumenfeld is cancelled.

Administrative Branch

Capt. G. Aste to be Capt., from (S.O.); May 1.

Lieut. (actg. Capt.) E. J. Smyth to be Lieut., from (A.), and retains his actg. rank whilst employed as Capt., from July 31, 1918, to April 30.

Lieut. C. F. Eckel to be Lieut., from (A.); Feb. 7 (substituted for notification in *Gazette* Feb. 7).

Lieuts. to be Lieuts., from (S.O.):—H. Atkins, J. E. Pike, J. B. F. Watson; May 1.

Sec. Lieuts. to be Lieuts.:—(Hon. Lieut.) A. Colling, C. C. Gardiner, J. Gardner, E. J. Girdler, (Hon. Lieut.) G. A. McMillan; April 2. (Hon. Lieut.) U. B. Gilbert; April 5, 1918. S. F. A. Welsh; July 22, 1918. T. S. Miller; July 28, 1918. J. S. Archer; Sept. 31, 1918. J. H. Payne, M.C.; Oct. 11, 1918. A. L. Kent; Oct. 22, 1918. H. T. Bolt; Oct. 23, 1918. (Hon. Lieut.) N. S. Beale; Oct. 27, 1918. A. P. Steer; Dec. 30, 1918. E. J. Crowe, E. R. Harris; Jan. 5. E. W. Bourne; Feb. 16. W. Lienard, M.B.E.; Feb. 24. A. McGoddard; Feb. 26. E. E. Page; Feb. 28. J. F. Groom; March 7. L. Singer, J. Hustwaite, from (S.O.); March 16. F. S. E. May; March 26. H. Royston; April 1.

Sec. Lieuts. to be actg. Lieuts. till April 30.—W. D. Cooney, F. Drake, F. Dallow (substituted for notification in *Gazette* Jan. 31). D. T. Davies, (Hon. Lieut.) T. J. Harrington, F. E. Hudson, T. Moorcraft, R. H. Sturgeon T. Surr (substituted for notification in *Gazette*, March 28). W. Shaw, R. N. Walter; Sept. 18, 1918. W. W. Archer; Sept. 21, 1918. E. J. Jordan; Sept. 23, 1918. E. C. St. A. Newby; Sept. 24, 1918. (Hon. Lieut.) T. Sutherland; Oct. 10, 1918. W. R. Bowmer; Nov. 1, 1918. J. O. Minshall; Nov. 8, 1918. (Hon. Lieut.) R. Blackith; Jan. 25. H. C. Wilkin; March 1.

Sec. Lieuts. to be actg. Lieuts. till April 30, without pay and allowances of that rank:—(Hon. Maj.) J. L. McLean, C. Lyons; Sept. 16, 1918. N. W. Seyler; Oct. 15.

J. G. N. Clift (Lieut., R.E.) is granted a temp. commn. as Lieut.; April 1. Sec. Lieut. P. James to be Sec. Lieut., from (O.); Oct. 12, 1918 (substituted for notification in *Gazette* Feb. 4).

(Then follow the names of 33 officers who are transfd. to the Unemployed List under various dates.)

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—B. S. Andrew (contracted on active service), A. de M. Bellairs (contracted on active service); May 8. J. W. Holdsworth; May 14.

The following relinquish their commns. on account of ill-health:—E. G. Akhurst (Devon R., I.F.) (contracted on active service); May 5. Actg. Capt. D. A. M. MacManus (R. Innis. Fus.), caused by wounds; May 9.

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—A. F. Foulter; May 9. A. Moore; May 12. S. J. Darmody (caused by wounds), H. W. Turner; May 13.

The Christian name of Capt. Henry Cox is as now described and not E. Cox as stated in *Gazette* of April 4.

The notification in *Gazette* of Nov. 8, 1918, concerning Lieut. W. H. Foy is cancelled.

The notification in *Gazette* of March 11 concerning Sec. Lieut. R. C. Rogers is cancelled.

The notification in *Gazette* of May 6 concerning Capt. (actg. Maj.) N. A. Daniell is cancelled.

Technical Branch

Sec. Lieuts. to be Lieuts.—H. Chapman; July 12, 1918. J. E. Keoford, C. G. Stevens; Aug. 2, 1918. S. J. Fountain; Sept. 14, 1918. T. E. Morton; Jan. 18. F. A. Beale; Jan. 27.

Sec. Lieuts. to be Lieuts., without pay and allowances of that rank:—T. Allan, (Hon. Lieut.) F. Baxter, C. H. Blakeway, C. Cadman, R. Donald, (Hon. Lieut.) F. E. Glass, (Hon. Lieut.) J. B. Glass, E. A. Gulson, C. B. Monkman, A. R. Rouse, H. Scott, (Hon. Lieut.) H. H. W. Vowden; April 2, 1918. C. J. Geddes; April 9, 1918. E. W. Brooks, R. E. Pudney; June 8, 1918. (Hon. Lieut.) E. A. Baker, M.C.; June 16, 1918. G. R. Willis; June 19, 1918. A. Christian; Aug. 2, 1918. (Hon. Lieut.) T. G. S. Symonds-Babb; Aug. 14, 1918. V. E. R. Bolton; Aug. 20, 1918. (Hon. Lieut.) A. G. Mortlock; Oct. 11, 1918. J. K. Shrimpton; Oct. 13, 1918. J. Buckthought; Oct. 13, 1918. R. H. Semmence; Oct. 26, 1918. H. H. Ballard; Nov. 25, 1918. D. W. Emonds; Dec. 2, 1918. (Hon. Lieut.) F. H. L. Varcoe; Dec. 30, 1918. J. M. Kearney-Dodds; Jan. 1. C. L. Taylor; Jan. 12. J. C. Shakeshaft; Jan. 31. G. J. Finley; Feb. 16. G. Glenn, C. W. Triggs; Feb. 24. H. W. Halifax; Feb. 25. G. Ashworth; Feb. 29. T. Mundy, F. A. Murray; May 8. A. Broadley, F. S. Mockford, H. B. Norris; March 24. M. G. Church; April 3. E. V. T. Knight; April 5. C. B. Pensotti; April 17. G. Betts, C. T. Davis, F. Whilton; April 18. W. J. Aubert, A. Hill, H. Hillsdon, H. W. Nicholl, W. H. Saunders, W. F. Wallace; April 19. R. D. G. Macrostie; April 20. J. Armitage, P. L. Hill, H. Woffenden; April 23. A. H. S. Syngé; April 24. C. A. C. Fidler, F. W. Powell; April 28. H. B. Hawker, L. J. Lipscomb; April 29.

Sec. Lieut. E. J. Peek to be actg. Lieut. whilst employed as Lieut., Grade (B), from (A.), from Jan. 25 to April 30.

The following relinquish their commns. on ceasing to be employed:—Sec. Lieut. (Hon. Lieut.) W. A. Lepper (E. Kent R.); July 2, 1918. Capt. A. Landen, D.S.O. (North'd Fus.); April 11. Capt. (actg. Maj.) E. Graham; May 9.

(Then follow the names of 40 officers who are transfd. to the Unemployed List under various dates.)

Sec. Lieut. (Hon. Lieut.) P. A. Albrecht relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain the rank of Lieut.; May 9.

Sec. Lieut. E. A. Morrow relinquishes his commn. on account of ill-health, and is permitted to retain his rank; May 13.

Sec. Lieut. H. Falkner (R.E.) relinquishes his commn. on account of ill-health; May 12.

The surname of Sec. Lieut. G. W. Heugh is as now described, and not Hengh, as stated in *Gazette* of Jan. 24.

The notification in *Gazette* of Nov. 22, 1918, concerning P. Alden is cancelled.

The notification in *Gazette* of April 1 concerning Lieut. (actg. Capt.) H. Jones is cancelled.

Medical Branch

Lieut. W. C. A. Ovey is transfd. to the Unemployed List; March 25.

Memoranda

The following relinquish their commns. on ceasing to be employed:—Lieut. J. B. Hamilton; Feb. 16. Temp. Hon. Lieut. W. C. Boswell; May 16.

(Then follow the names of 10 officers who are transfd. to the Unemployed List under various dates.)

The rank of Lieut. (actg. Capt.) J. E. B. Cochrane is as now described, and not Sec. Lieut. as stated in *Gazette* of May 9.

The notification in *Gazette* of March 14 concerning Lieut. P. S. Woodroffe is cancelled.



Canada's Effort

FROM a report published by the Ministry Overseas of the Military Forces of Canada it appears that over 8,000 Canadians have held commissions in the different Air Forces,

while, including other ranks, about 15,000 Canadians entered either the Royal Flying Corps, the Royal Naval Air Service, or the Royal Air Force. The Canadian Air Force has now been established on a separate basis, and it will have about 109 machines available when it returns to Canada.

FLYING LESSONS IN PICTURES

ONE of the many innovations introduced into the training of the Royal Air Force during the War was the diagram. Naturally during hostilities most of the work had to be kept secret, as many of these diagrams illustrated subjects that would have been of considerable use to the enemy if he had been able to get a glimpse of them. The scheme, though started in a small way a year earlier, was really developed to the perfected state it later became by the Officer-in-Charge, Aerial Diagrams, Mr. G. H. Davis, the well-known black-and-white artist, whose aerial drawings have enhanced the pages of the *Sphere* and other well-known papers. Some examples of these diagrams are now being reproduced in the pages of *FLIGHT*.

Mr. Davis's idea, was to produce a picture illustrating a technical subject in its simplest form, so that the budding pilots and observers who were young men taken from all walks of life, the majority without any technical training, should quickly grasp the instructors' words. The idea was that as pictures pure and simple these diagrams would interest the pupils and thus would unconsciously drive home the point to be learned in the quickest possible way. The scheme became a tremendous success, demands for these diagrams coming in from all directions, and the R.A.F. was scoured for suitable artists. Every man was carefully tested by the officer in charge of the section, who soon had a very highly-skilled staff working in the specially-built studios at Section T5 at South Kensington.

Still the demand grew, and it was difficult to produce these aerial instructional diagrams quick enough, so that the aeroplane model and the camera were brought in to help. Models were constructed of the more important German and British machines, and these models were then photographed in every flying position, and carefully indexed. When a machine was required in a certain position for a diagram in hand, the files were examined and a suitable photograph selected. This was enlarged to exactly the dimensions required by the picture, and was then traced down on to the diagram, which already had its sky and ground painted in, and the drawing was quickly prepared, saving the time it would have taken to train the men to draw the aeroplanes correctly themselves.

All the Allied air force staffs were deeply interested in this new method of teaching, and deputations from practically all the Allied Governments visited the section to observe the manner of production, and with a view to attempting a similar scheme in their own lands, but it may be added that right up to the time of the Armistice none had succeeded, and these diagrams were the only things of their kind in existence, and were very extensively used in the training of the American and other Allied aviators.

The Board of Education also sent representatives, and it was at once realised that this manner of teaching by pictures had a very great future in our schools, and more will certainly be heard of it.

All the large original drawings by Mr. Davis and his staff have been acquired by the Imperial War Museum, and will be later on view in the R.A.F. Section. When training

ceased, and the schools of aeronautics were closed down, the work of this section was no longer required, and the staff were demobilised.

Very great care was taken to get these diagrams technically accurate in every detail; most of our finest fighting pilots gave their valued advice and assistance, and rough sketches



Mr. G. H. Davis, the artist, whose aeronautical work has become so well known

were always prepared and carefully examined by many expert eyes before the actual picture was put in hand. Machines were examined and sketched on the spot, and no diagram was carried out until it was proved by experience that a certain point required more clearly driving home.

A portrait of Mr. G. H. Davis, by Marcus Adams, F.R.P.S., is reproduced by us.

CORRESPONDENCE

EFFECT OF COLD ON OIL.

[1976] AMONG the many theories advanced to account for the disappearance of Mr. Hawker is a report from Reuter's correspondent at St. John's, which has appeared in your columns, in which it is suggested that his engine may have been affected by intense cold, due to the presence of many icebergs, which had congealed the oil.

This is a statement which we hasten to refute, as it reflects seriously on our own reputation. It is common knowledge throughout the Air Service and the aircraft industry that Mr. Hawker was using for the lubrication of his Rolls-Royce motor our oil, known as Castrol "R"—the oil, in fact, which has been selected exclusively by every British competitor in the Atlantic race—and one of the important reasons for its selection has been its remarkable cold-resisting properties. Castrol "R" has successfully withstood a temperature of 28 deg. Fahr., or 58 degs. of frost, much lower than any other aero-engine lubricant will stand without congealing, and the long list of records for altitude and other flights

accomplished with its assistance, including the world's highest flight made by Captain Lang on a De H. 9 (Napier Lion engine), affords ample proof of this special property.

We do not believe for one moment that any such extreme cold as 58 degs. of frost would be met with in the latitude in which Mr. Hawker and his equally brave companion, Commander Grieve, set out on their great adventure. It has been stated that the American flying boats suffered from oil troubles on their motors, but it is understood they were using a lubricating oil of very different character from our own product.

In view of the universal interest shown by the public in every theory relating to the disappearance of these gallant men, and in justice to ourselves, we trust you will be good enough to find room for this letter.

C. C. WAKEFIELD AND CO., LTD.
W. R. GRAHAM, Managing Director,

30 and 32, Cheapside.
May 22.

Sweden and German Machines.

AN outcry has been raised in Sweden by the accidents which are befalling the machines which were purchased from Germany. Two more accidents occurred last week,

one to a flying boat and the other to a military machine, but fortunately no lives were lost. The Government is being urged to have all German machines which have been purchased thoroughly inspected and overhauled by experts.

COMMERCIAL AVIATION

ADDRESSING the Liverpool Chamber of Commerce on Monday on some aspects of commercial aviation, Maj.-Gen. Sir F. H. Sykes, Controller-General of Civil Aviation, emphasised once more the importance of ensuring a very high standard of efficiency and trustworthiness in British pilots. In order to achieve that standard it would be necessary for the pilot to pass through a school of "aerobatics," although he would never "stunt" except for practice, and on such occasions he must be alone and well away from towns. It was the intention of the Ministry severely to discourage "stunting" in the popular sense of the term, and he mentioned that of the accidents reported since the 1st inst., when the restrictions on civil aviation were removed, only three cases of injuries had occurred in "civil" machines, and none of those was fatal. Speaking of the methods of assisting the air navigator which remain to be developed, he said the first was directional wireless, which entailed the setting up of large wireless stations—"the only safe means by which aircraft on long-distance oversea passages may safely know their position." It was hoped, in the course of the development of our meteorological service, to discover consistent wind currents analogous to ocean currents, and thus furnish the airman with air charts.

Gen. Sykes said that one very practical way in which the railway companies could greatly assist navigation was by having the name of every station marked in very large letters in a way which could best be seen from the air. It should also be possible for the more important stations to have the lettering lit up to assist night travel. Another suggestion had been made that wireless rays should be directed upwards from towns giving their names at night. A very serious drawback to many aerodromes from a commercial point of view was their distance from the towns they served. The termini of our air routes must be as accessible as those of our great railway systems. It might be that landing would have to be permitted first in parks and

other open spaces in large towns, or, later, that the roofs of central railway stations should be constructed so as to form overhead landing stages.

Gen. Sykes said that a few of the concrete problems to be faced by manufacturers may be summarised as follows:—Reduction in the quantity or weight of fuel necessary per horse-power; simplification of design of engines; production of machines capable of landing in small space and rising again from it; increase in comfort of crew and passengers; the silencing of engines; and the attainment of increased stability. Security and regularity are the essence of the problems. Great speed and climbing power relinquish their importance until real security and regularity have been achieved, when, of course, their claims will again rise.

But though much assistance would be gained by improvement in the directions he had indicated, yet he did not know if they felt with him that they had arrived at a point defining the end of a particular and abnormally steep "curve" in advancement. There seemed to be what he could only describe as a "gap" in front of them. They could mentally pick up the probable future curve of progress some little way ahead. But there was some very important present link missing. If he was right it was for our inventors and designers to search, and while they, as he knew they would, gradually find and fashion the link, it is for them to consolidate and improve their present position, to move forward steadily and firmly, but with caution.

It was possible that the airship might help them to advance in many directions whilst the "gap" was being bridged. At all events, both the heavier- and lighter-than-air types of aircraft had their appropriate places in aviation. He hoped it might not be long before a British airship would cross the Atlantic. Much knowledge would be gained by such a flight, and it would help to cement the excellent relations which had grown up between the British and American Air Services during the War.

Honours for Naval Work

It was announced in a supplement to the *London Gazette* on May 24 that the King has been pleased to approve of the following awards:—

Distinguished Service Cross

Flight-Lieut. C. G. Bronson, R.N.A.S. (now Capt., R.A.F.).—For carrying out a determined bombing attack on the "Goeben" on January 24-25, 1918, flying low down under heavy anti-aircraft fire.

Meritorious Service Medal

C.P.O., 3rd Class, E. A. Boyd, R.N.A.S., O.N. F3632.

The following decoration has been conferred by the President of the French Republic for distinguished services rendered during the War:—

Croix de Guerre

Eng. Lieut.-Commander E. F. Briggs, D.S.O., R.N. (now Lieut.-Col., acting Col., R.A.F.).

The Flight to Australia

FROM the full rules of the competition for the £10,000 prize offered by the Australian Government for a flight from Great Britain to Australia which are printed in full on page 700, it will be seen that there is only one difference from the summary given in our last issue. This is in the matter of controls, of which there will only be one—at Singapore.

Two entries have been received, one from Mr. Bert Hinckler of a Sopwith Dove, with Le Rhone engine, and the other from Lieut. C. Kingsford-Smith and Lieut. V. Rendle of a Blackburn Kangaroo with two Rolls-Royce Falcon engines.

A Handley Page Endurance Test

A VERY satisfactory endurance flight was carried out last week from a Royal Air Force aerodrome in Norfolk by a four-engined (Rolls-Royce) V/1500 Handley Page service machine. Carrying a crew of five officers and three other ranks, the machine left the aerodrome at a few minutes before eight in the morning and did not land again until twenty minutes to eight at night, completing 11 hours 33 mins. in flight.

The total distance flown over the ground was 836 miles, corresponding to a mean speed of 72.8 miles per hour, with a load of 24,890 lbs. all on.

In the course of the flight, Birmingham, Southport, Manchester, Lincoln, London, Felixstowe, Yarmouth, and Hunstanton were visited.

England to Hold Schneider Trophy Race

AMONG the decisions taken last week at the meeting of the International Aeronautic Federation was one asking the Royal Aero Club to organise the international seaplane race for the Jacques Schneider Trophy and £1,000 in England next September. The race will be for a distance of 200 miles over the sea, with a minimum circuit of five miles. Entries are promised from Great Britain, France, Italy, Spain, U.S.A. and Belgium. It will be recalled that the trophy was won for Great Britain by Mr. C. Howard Pixton, on a Sopwith seaplane, at Monte Carlo in April, 1914. The race will probably be held on the South Coast.

No Gordon Bennett Contests this Year.

THE International Federation has decided not to organise any competitions this year for the Gordon Bennett Aviation Trophy, or the Gordon Bennett Balloon Trophy. The last contests for both these trophies were in 1913, the former at Rheims, in 1913, when it was won for France by M. Prevost, while the competition for the latter started from Paris and was won by Mr. Ralph H. Upson, one of the American representatives.

Next Meeting of the F.A.I.

LAST week's meeting of the International Aeronautic Federation in Paris was an extra-ordinary one. This year's annual meeting is to be held in Brussels, the date to be fixed later. Geneva has been selected as the meeting place for next year.

The Aero Clubs of Japan and Brazil have been admitted to membership of the Federation.

The French Height Record

IMPROVING on his performance of May 10 M. Sadi Lecoq, on his Spad-Herbemont, fitted with 300-h.p. Hispano-Suiza motor, climbed to a height which his barograph recorded as 8,800 metres (29,040 ft.). The barograph is being tested by the Aero Club of France.

French Aviation Losses

FROM official figures published in Paris, it appears that from the outbreak of War until the Armistice the losses of the French aviation service in the Army zones were 1,945 pilots and observers killed, 1,461 missing whose death is certain, and 2,922 wounded. In the interior zone the losses were 1,927 pilots and observers killed and wounded. The total number of airmen in the French Aviation Service on December 1, 1918, was 19,219.

SIDE-WINDS

MR. E. S. ANDREWS, B.Sc. Eng., has resigned his appointment as Technical Officer under the Air Ministry, and entered into partnership with Major J. Harold Beaumont, a registered patent agent, at 29, Southampton Buildings, London, W.C. 2., for the joint practice of consulting engineering and patents work. Both partners were for many years before the war members of the Examining Staff of His Majesty's Patent Office.

THE Manchester Office of the Hoffmann Manufacturing Company, Ltd., has been removed to Cleveland Buildings, 94, Market Street, Manchester (Telegraphic address: "Mannhoff, Manchester"; Telephone number: 2761 City), where there will be found a staff of trained engineers competent to advise clients as to the most suitable size and type of bearing for any work in which they may be interested. The office will also carry emergency stocks of Hoffmann bearings which can be drawn upon in case of urgency.

THE Patent Butted Tube Co., Ltd., ask that all correspondence and enquiries should now be addressed to their new offices at their works at Redfern Road, off Kings Road, Tysley. The postal address is Patent Butted Tube Co., Ltd., Hay Hall Works, Hay Mills, Birmingham. The 'phone call is Acoccks Green, 207, while telegrams should be addressed—Butted, Birmingham.

M. ESNAULT-PELTERIE, who is resigning the presidency of the French Society of Aircraft Constructors will probably be succeeded by M. Louis Breguet.

AT last there is to be a real auction sale of aeroplanes, 15 being down for disposal under the hammer at the sale which Messrs. Norbury-Smith and Co. will hold on June 2 at the No. 1 Aircraft Salvage Depot for the Disposal Board.

RESETTLEMENT

THERE are many officers and men of the R.A.F., who are demobilised or are about to be demobilised.

In order to assist those who are undecided or are seeking advice as to their prospects in civil life, the Editor has arranged for an expert, with wide experience of service, industrial and educational conditions, to give advice to those who may solicit it through the medium of this Journal.

Applications, which must be in writing, should be marked *Resettlement*, and addressed to the Editor, FLIGHT, 36, Great Queen Street, Kingsway, W.C. 2. They will be dealt with in these columns, as far as possible, in rotation.

W.S., EX-FLIGHT SERGT. (Rigger).—In spite of your excellent record you may experience great difficulty in finding employment in civilian aviation. It is largely a matter of supply and demand. We think you will be best advised to resume your pre-war occupation and await progress in commercial aviation. You should watch the "Situations Vacant" columns in this journal; for example, in last

week's issue (May 22, 1919), Messrs. Handley Page, Ltd., Cricklewood, N.W. 2, advertised for aerodrome fitters and riggers.

When applying for a situation you should give details of your experience, such as the particular machines with which you are familiar, your age, etc.

J.J.S., EX-RIGGER.—Models are not required when patenting an invention. The idea can be described and illustrated by engineering drawings. A fee of £1 has to be paid on making application to the Patent Office (25, Southampton Buildings, W.C.) for provisional protection of an invention. When a complete specification is filed, a fee of £3 is payable. A further fee of £1 is incurred on the application to have the patent sealed. The following fees have to be paid subsequently: 5th year, £5; 6th year, £6; 7th year, £7; 8th year, £8; 9th year, £9; and so on. With regard to the possibilities of employment as a rigger in civilian aviation see reply to W.S. above.

THE "STILL" ENGINE

A GOOD deal of speculation has been rife of late concerning the new engine which has been given such prominent notice in the daily press. Details of this mysterious prime mover were revealed for the first time on Monday of this week, during the reading of a paper before the Royal Society of Arts by Mr. Frank E. D. Acland, M.Inst.C.E. From the fact that the Hon. Sir Charles A. Parsons, K.C.B., was to preside at the meeting, it was deduced that the new engine, which is of British origin and called the "Still" after the name of its inventor, was of a revolutionary nature, and its introduction an epoch-marking event. Perhaps it may prove to be all this—but not to the motor industry, we think.

Apparently the engine in question is compounded of two existing types—the internal combustion engine and the

steam engine—for it is stated that the power stroke of the piston is derived from the combustion of liquid fuel in the main cylinder, while the return stroke of the piston is effected by the expansion of steam below the piston. The only new or unusual principle involved is that in this case the steam is generated by the heat lost in the exhaust gases, and to the cylinder walls during the power stroke. By this means some of the energy lost as heat is reclaimed, the saving being stated to amount to as much as a 25 per cent. fuel economy.

The system seems to be particularly applicable to large stationary engines using heavy fuels, especially engines of the Diesel type, but would appear to have little applicability to the petrol engine of the type used for cars and aeroplanes.

United States Army and the Industry

IT has already been made clear by the United States War Department that the necessity of keeping aviation going on a sound footing is realised, and it is understood that the United States Secretary of War is considering a scheme by which orders for at least 500 machines of the latest types may be given to American manufacturers.

United States to Build Rigid

FROM an announcement made in Washington it appears that the United States Naval authorities are preparing to spend about £2,000,000 in experiment with rigid airships for use in conjunction with the Navy. Mr. Daniels, the Secretary to the Navy, says that the Government must consider dirigibles purely from the standpoint of their value as adjuncts to the Navy and leave their development for commercial purposes to others.

Another Visitor from the United States

MAJOR BENEDICT CROWELL, the United States Assistant Secretary for War, is on his way to Europe with a number of experts with a view to collecting information which will enable the Government at Washington to encourage the United States aircraft industry so that in the event of the nation having to go to war again it shall not be in the same predicament as when it joined the Allies. Major Crowell proposes to consult the Air Ministries of Great Britain, France and Italy.

Aerial "Black Maria"

DAYTON police are claiming to be the first to really use an aeroplane for the purpose of transporting a prisoner. Police Inspector Yendes flew over to Indianapolis in a machine piloted by Mr. Harry Walhon, and flew back with a prisoner, Robert T. Tamplin, who was accused of embezzlement.

Ex-R.A.F. Officers' City Club

PROGRESS has now been made in connection with the Club for ex-pilots, observers and ground officers of the R.A.F. in the City, and Capt. Bentham, Mr. L. Guyer, Major O. Modin, D.S.C., and Capt. S. J. Read have been elected to the Committee. Mr. E. W. Roberts, who has been appointed Hon. Secretary, will be pleased to give further particulars to anybody interested if they will write to him at the Ex-R.A.F. Officers' City Luncheon Club, 1, Royal Exchange Avenue, London, E.C. 3.

Aerial Insurance

NOW that the question of insurance of machines, passengers, pilots, goods, etc., is so very much to the fore, we shall be pleased to receive enquiries from companies or individuals interested in the subject, with a view to arranging rates, etc., under Lloyd's policies. Enquiries should be addressed to F. King and Co., Ltd., agents for aeronautical, motor and general insurance, 36, Great Queen Street, Kingsway, W.C. 2, who are in a position to quote the lowest market rates.

COMPANY MATTERS

D. Napier and Son, Ltd.

THE directors' report and balance sheet to September 30, 1918, states that the profit, after allowing for depreciation of premises, plant and tools, amounted to £142,335 17s. 4d.; to which is added the balance brought forward from last account, £18,738 15s. 2d.; total £161,074 12s. 6d. Deduct dividend for the year on preference shares to June 30, 1918, and interest on debenture stock to September 30, 1918, £28,000; income tax, £6,901 14s. 10d.; directors' and trustees' fees, £985 6s. 1d.; commissions to managers, £5,363 15s. 9d., leaving a balance of £119,823 15s. 10d. A dividend of 10 per cent. (less income tax) on the ordinary shares was paid on January 4, 1919, absorbing £35,000, and the directors now recommend a bonus of 2s. 6d. per share on the ordinary shares (free of income tax) amounting to £43,750; to place to general reserve a further £35,000 (making £95,000); total, £113,750; and to carry forward to next year a balance of £6,073 15s. 10d. During the period under review the company has been entirely employed on Government work, and with the increased facilities of additional premises and plant referred to in the last report, has been enabled to still further increase its output to a figure exceeding all previous years. Important progress in the development and manufacture of aero engines has been made during the past year. The Napier engine, known in the Royal Air Force as the "Lion," has already established its reputation for record performances including the altitude record.

NEW COMPANIES REGISTERED

A. E. CO., LTD., 59, Chancery Lane, W.C.—Capital £1,000, in £1 shares. Aircraft and general engineers, etc. First directors: H. J. Heasman, J. J. Clifford and J. E. Clark.

AEROFILMS, LTD.—Capital £3,000, in £1 shares. Suppliers of cinematograph films of aerial incidents, etc. Directors: C. Graham-White, F. L. Wills and H. W. Matthews. Solicitors: G. Reader and Co., 35, Coleman Street, E.C. (2).

AIRCRAFT COMMUNICATION AND METEOROLOGICAL SURVEY CO., LTD., 24, Martin's Lane, E.C. 4.—Capital £2,000, in £1 shares. To make surveys for air routes, aerial railways or otherwise, to design and plan "air routes for air route construction," etc.

ANGLO-BELGIAN AVIATION AND MECHANICAL CO., LTD.—Capital £15,000 in £1 shares. Solicitor: H. S. Holt, 6, Gray's Inn Square, W.C. (1).

BEAUFORTS, LTD.—Capital £50,000, in £1 shares. Manufacturers, etc., of balloons, aeroplanes, motor cars, etc. Solicitor: H. S. K. Gregson, 49, St. James' Street, London.

FLYING BOATS CO., LTD.—Capital £50,000, in £1 shares. Manufacturers of and dealers in flying boats, and aircraft generally, etc. Solicitors: Simmons and Simmons, 18, Finch Lane, E.C.

W. H. HARRISON (BURNLEY), LTD.—Capital £20,000, in £1 shares. Aeronautical, automobile and general engineers. Directors: W. H. Harrison, R. Taylor and J. G. Parkinson. Solicitor: J. C. Waddington, Imperial Chambers, Grimshaw Street, Burnley.

L. HUGUENIN, LTD.—Capital £10,000, in £1 shares. Luminisers of watches, aeronautical and scientific instruments, etc. Director: Miss L. Huguenin. Solicitor: J. A. White, Stevenage House, 40-44, Holborn Viaduct, E.C. (1).

OSBORNE, THOMPSON AND CO., LTD., 35a, Summer Lane, Birmingham.—Capital £3,000, in £1 shares. Manufacturers of screw and other gauges, jigs, and tools of all kinds, aero engineers, etc.

PYROTECHNICS, LTD.—Capital £10,000, in £1 shares. Manufacturers of and dealers in fireworks, aerial and other signals, flares, etc. First directors: Major C. Etchells, D.S.O., M.C., G. J. Jones and C. R. Harler.

JOHN ROBERTSON, BELFAST, LTD., 42, Berry Street, Belfast.—Capital £2,000, in £1 shares. Expert magneto repairers and adjusters. First director: J. Robertson.

W. T. T. ENGINEERING CO., LTD., 6-10, Dalling Road, Hammersmith.—Capital £10,000, in £1 shares. Acquiring business formerly carried on at Burnham Street, Kingston-on-Thames, and now at 6-10, Dalling Road, Hammersmith, as the Aeroplane Components Company, and the business carried on at the last-named address as the General Aircraft and General Engineering Company, Ltd. First directors: M. J. Ward, B. Trett, and H. F. Tully.

✻ ✻ ✻ ✻

If you require anything pertaining to aviation, study "FLIGHT'S" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages xlvii, xlviii, xlix and l)

Aeronautical Specifications Published

Abbreviations:—cyl.=cylinder; I.C.=internal combustion; m.=motors.

APPLIED FOR IN 1916

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published May 22, 1919

- 13,144. F. H. ROYCE, B. I. DAY and ROLLS-ROYCE, LTD. Structures for supporting outboard propellers. (125,620.)
13,685. VICKERS, LTD., and J. McKECHNIE. Fabrics for aircraft gas-bags. (125,636.)
13,790. H. R. RICARDO. Mounting and driving of propellers. (125,640.)
13,892. J. GAUNT. Controls for aircraft. (125,643.)
14,201. F. C. NESTLER and F. C. NESTLER, LTD. Aeroplane hangars. (125,648.)
14,499. W. S. SMITH. Measuring speed of aircraft and sighting gravity shots therefrom. (125,654.)
14,545. W. S. SMITH. Aeroplanes, etc. (125,655.)
14,616. BLACKBURN AEROPLANE AND MOTOR CO. and Others. Propellers. (125,658.)
14,884. W. S. SMITH. Aeroplanes, etc. (125,669.)
17,109. C. M. VON EUGEN and H. LETCHFORD. Wings, etc. (125,670.)

Published June 5, 1919

- 18,539. E. H. MOORE. Aeroplanes. (126,342.)

APPLIED FOR IN 1917

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published June 5, 1919

70. A. V. ROE. Tilting or warping mechanism for planes. (126,350.)
308. F. SAGE AND CO. and C. W. TINSON. Aeroplanes. (126,354.)
492. H. SMITH. Aeroplanes. (126,360.)
549. W. K. BOYNE. Gun mountings for aircraft. (126,364.)
567. A. V. ROE. Aircraft. (126,365.)
1,267. VICKERS, LTD., and H. A. SAVAGE. Guns for aircraft. (126,386.)
1,428. E. E. BROWN. Metal spars for aircraft. (126,391.)
1,430. SOPWITH AVIATION CO. and H. A. KAUPER. Means for synchronising firing of gun with rotation of propeller. (126,392.)
1,432. A. A. D. LANG. Hubs or bosses for aeroplane propellers. (126,393.)
11,301. E. DODSON. Altitude control for carburettors of aircraft. (126,399.)

APPLIED FOR IN 1918

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published June 5, 1919

- 5,748. H. W. SYKES. Interrupter gears for aircraft guns. (126,417.)
7,429. C. H. GRAY. Frame members for aeroplanes. (126,437.)
7,554. BUTLER'S, LTD., and A. REEVES. Trainers or turnbuckles. (126,445.)
7,736. T. HANCOCK. Propellers. (126,456.)
8,537. E. A. WILLSON and J. DEWAR. Hangars, etc. (126,492.)
8,590. G. H. THOMAS and H. M. KETTELWELL. Fairings for use on aircraft. (126,496.)
9,219. W. H. CULLEN. Control levers. (126,505.)
9,561. A. A. EMBIRICOS and G. DE FEURE. Aeroplanes. (126,510.)
9,814. NIEUPORT and GENERAL AIRCRAFT CO. and H. P. FOLLAND. Fuselages. (126,514.)
9,816. NIEUPORT and GENERAL AIRCRAFT CO. and H. E. PRESTON. Attachment of aerofoils of aeroplanes. (126,515.)
10,386. J. R. GREG and METROPOLITAN CARRIAGE, WAGON AND FINANCE CO. Anti-aircraft guns. (126,521.)
10,552. J. BOUTELLE. I.C. engines for aircraft. (118,839.)
14,651. R. FRASSINETTI. Aeroplanes. (126,556.)
16,392. J. F. VERNER. Aeroplane controls. (126,568.)
18,387. S. W. HISCOCKS and E. J. EDGAR. Wheels for aircraft. (126,575.)

✻ ✻ ✻ ✻

NOTICE TO ADVERTISERS.

IN order that "FLIGHT" may continue to be published at the usual time, it is now necessary to close for Press earlier. All Advertisement Copy and Blocks must be delivered at the Offices of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, not later than 12 o'clock on Saturday in each week for the following week's issue.

FLIGHT

and The Aircraft Engineer

36, GREAT QUEEN STREET, KINGSWAY, W.C. 2.

Telegraphic address: Truditur, Westcent, London.

Telephone: Gerrard 1828.

SUBSCRIPTION RATES

"FLIGHT" will be forwarded, post free, at the following rates:—

UNITED KINGDOM.				ABROAD.			
	s.	d.		s.	d.		
3 Months, Post Free	7	1	3 Months, Post Free	8	3		
6 " " "	14	1	6 " " "	16	6		
12 " " "	28	2	12 " " "	33	0		

These rates are subject to any alteration found necessary under war conditions.

Cheques and Post Office Orders should be made payable to the Proprietors of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, and crossed London County and Westminster Bank, otherwise no responsibility will be accepted.

Should any difficulty be experienced in procuring "FLIGHT" from local newsvendors, intending readers can obtain each issue direct from the Publishing Office, by forwarding remittance as above.